A REPORT OF THE

SCIENCE TALENT SEARCH EXAMINATION

1966

K. N. SAXENA
M.A., B.Sc, M.Ed., Ph.D.
Field Adviser,
Department of Science Education, N.C.E.R.T.,

Department of Science Education
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH & TRAINING
N.I.E. Buildings, Mehrauli Road, New Delhi-16.

Published by

Department of Science Education,
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
N.I.E. Buildings, Mehrauli Road, New Delhi-16.

First published—Sept. 1968—1,000 copies

Printed by The Bengal Press, Azad Market Delhi 6.

Science Talent Search Series 20

Published by

Department of Science Education,
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING
N.I.E. Buildings, Mehrauli Road, New Delhi-16.

First published—Sept. 1968—1,000 copies

Printed by The Bengal Press, Azad Market Delhi 6.

FOREWORD

This is the fourth report on the National Science Talent Search examination which was conducted in January, 1966. 6065 students appeared at this examination, 963 were called for interview and finally 354 were selected for the award.

In the present report, Dr. K.N Saxena, Field Adviser in the Department has analysed the data systematically and has interpreted the same giving rise to some important issues which will be of use to the research workers, educationists, teachers and psychometricians The report contains some important issues like the accelerated programme for the awardees, parallel schemes in India and abroad, item analysis of the Science Aptitude Test, suggested areas for further research and allied problems.

N.I.E. Building
Mehrauli Road,
New Delhi-16.

M. C. PANT
Head of the Department of Science Education,
National Institute of Education.

PREFACE

This is the fourth report on the National Science Talent Search Scheme, sponsored by the National Council of Educational Research and Training. The first three reports were published in the years 1963, 1964 & 1965 respectively and they were found to be useful to the teachers, educationists, research workers and educational administrators. The interpretations of the statistical analyses, as incorporated in the previous reports, were useful in promoting better standards of learning and teaching at the secondary level. They were also interesting from the point of view of further applications of research findings in the field of educational research.

With the encouragement provided by the presentation of the two previous reports, this year the work has been taken up on parallel grounds. During the year under report, 6,065 students appeared at the National Science Talent Search Examination. 963 students were called for interview on the basis of written tests and finally 354 students were selected for the award of scholarship. The present report gives a clear cut idea that the Scheme is not specifically meant for awarding scholarship to meritorious students but on the other hand the main objective of the Scheme is to nurture the identified talent as best as the circumstances permit. The statistical analyses, some of which have been carried out on the total sample and others on a representative sample, indicate that there are some very vital issues which have to be given due consideration and resolved in order that scientific talent can be promoted in the country. This is all the more necessary because of the importance of the scientist's role in the work of national reconstruction.

The results of the analyses have been quoted faithfully and objectively. Every effort has been made to bring to light even the most unexpected results in order to support the true spirit of research work.

The most important feature of this report is the working out of the discriminative and difficulty values of the items; the reliability of the test as a whole and the inter-correlations between various variables. These details are vital to improve the tools of selection and to educate the teachers regarding the simple statistical designs of experiments.

It is hoped that this report will be of interest to the teachers, educationists, scientists, educational administrators and research workers, who are actively engaged in the task of building up stronger India.

I am grateful to Shri S. K. Batra, Senior Statistical Assistant in my office for helping me in the preparation of this report.

K. N. SAXENA
Field Adviser

Department of Science Education
National Council of Educational
Research and Training.

N.I.E. Buildings,
Mehrauli Road,
New Delhi-16.

CONTENTS

CHAPTER I

Some Salient Features Of The National Science Talent Search Scheme

1.1 Introduction :

Considering the significant impact of science and technology on the process of national reconstruction, it becomes imperative that the country should be capable of producing a team of brilliant scientific and technical personnel in a short span of time. This is a very important and up-hill task and needs careful planning and an action in advance.

The perennial question is "Can scientists be identified and nurtured or they are an out-come of pre-designed circumstances and heredity?" The answer to this question is a very complicated one. Many people believe that aptitudes are not inherited and therefore if a suitable environment is provided, it is possible to nurture this intellectual faculty to a remarkable extent. There is another school of thought which believes that aptitudes are hereditary and are also dependent upon environmental circumstances. It is, however, true that some basic intellectual potentialities should be present in order that an individual can profit by an accelerated environment. Empirical experience has shown that it is possible to spot children and adolescents having superior or above-average mental potentialities and then to nuture these on specific scholastic and vocational lines. If this holds good, it should be possible to pick out individuals having basic mental faculties and nurture their talents according to their specific aptitudes.

It is a matter of experience that the two important cross-roads, when the individuals need maximum educational and vocational guidance, are at the end of the middle stage of school education and at the terminal of the secondary stage of education. Building up our hypotheses on this postulate, it seems necessary that any attempt for providing concentrated guidance and counselling should be primarily pinned down at these two terminal stages.

The terminal stage of the secondary education seems to be more important because it is at this stage that the individuals have to lay the foundations of a professional career and have to orient their educational studies accordingly. It is an admitted fact of reality that amongst the multitudes of adolescents and youths at this stage, few possess marked mental abilities and a very defined type of aptitude. Experiments have shown that such adequately goal-oriented individuals, if picked-up by suitable techniques, can form the real core of a team of future intelligentia provided their talents are nurtured comprehensively.

In the field of science, the necessity for spotting talented scholars at an early stage (having an aptitude for scientific studies) is of utmost importance for bringing about speedy national reconstruction. This early identification will not only mean clear-cut encouragement to the bright students but will also fulfil a well defined national objective of education concerned with the fostering of talents.

1.2 Some Salient Features Of The National Science Talent Search Scheme :

In order to identify academically bright students in basic sciences at the end of the secondary stage, the National Council of Educational Research and Training, through its Department of Science Education, formulated an exhaustive All-India Scheme in 1964, known as the "National Science Talent Search Scheme". Under this scheme, a suitable number of scholars are awarded scholarship from the B.Sc. first year (of three years degree course) up-to the end of the Doctorate level. A poilot project was conducted in the territory of Delhi in 1963, and 10 scholars were selected for the award of scholarship and a certificate of merit. From 1964, this scheme was extended all over the country and an all-India competition is held annually since that time on the first Sunday in the month of January each year. The main tools of selection are designed by the Department of Science Education with the help of the academic staff of the various universities in India.

After the identification of a set of brilliant students from all over the country, the main aim remains to nurture their abilities in the best possible way. This requires creative thinking and certain other accepted and well defined practical steps. From July 1966, the problems connected with placement, follow-up, appointment of individual guides and organisation of accelerated courses have been taken up.

The awardees are placed in selected institutions spread all over the country. The main idea is that they should get suitable academic environment so that they can utilise their potentialities to the maximum possible extent. It is also contemplated that these awardees should be attached to some enthusiastic teachers for academic and personal guidance. The Department of Science Education is also trying to supplement the programme of accelerated education by holding summer schools in different parts of the country. During 1966, sixteen summer schools were held as a part of the follow-up programme and a brief report regarding some of these summer schools is given in Appendix No. 1.

1.3 Objectives of the Scheme :

The main objectives of the scheme are :

1. to identify boys and girls at the close of secondary stage who possess a marked aptitude for science;

2. to stimulate scientific talent by a competitive process and recognition of merit;
3 to help such students to pursue courses in basic sciences by the award of scholarship from B Sc to Ph.D stage;
4. to provide special programmes in science to such scholars with a view to nurture the talent in the best possible way;
5. to encourage schools to take more active interest in the search for scientific ability and;
6. to help in building up a body of future scientists who will contribute to the scientific advancement, both in pure and applied fields.

1.4 Other Outcomes of the Scheme .

Certain other outcomes are also expected to emerge out of this programme, the most important of which are :

* to create consciousness amongst educationists for improving the school syllabi pertaining to science subjects, methods of teaching and evaluation techniques,
* to provide colleges, universities and technical institutions with a means of contacting science students of high ability ;
* to mobilise the interest and support of higher centres of learning and other science agencies for the development of scientific talents.

1.5 Abilities and skills to be tested :

The programme seeks to assess the pupils' :

* aptitude for science;
* powers of scientific reasoning and skill in scientific experimentation;
* ability to apply knowledge and to analyse and interpret scientific data;
* ability to express scientific concepts clearly and precisely;
* creativeness and mental alertness in the investigation of the scientific phenomena;
* awareness about the basic nature of science;
* knowledge about the recent developments in the various branches of pure and applied sciences, and
* skill to devise and develop some original ideas experimentally.

Thus, it will be evident that this National Scheme has been designed to fulfil an important need of the country i. e. to provide basic scientists to the

various national laboratories, defence establishments, universities and allied institutions. The industry will also be ultimately benefitted through the academic net-work of this scheme.

The results of the follow-up studies have not been very encouraging because of many obvious reasons. The students who get the National Science Talent Search award are ultimately admitted to such institutions where age-old traditional curricula, methods of teaching and evaluation exist. Secondly, there are hardly any opportunities for talented scholars to work independently on themes of their own choice. The load of memorisation is so heavy that it seems impossible for brilliant scholars to do any original work based on creativity and intellectual sagacity. These are some of the facts of reality which cannot be over-looked while analysing the results of this National Scheme.

CHAPTER II

The Techniques of selection

2.1 The selection procedure, as adopted during this year, was the same as in the previous years. Initial screening and final selection was based on the:

(i) marks obtained in science subjects in class X or an equivalent (considering the higher secondary system);

(ii) marks obtained in the three theory papers :

(a) the Science Aptitude Test

(b) the Essay Paper

(c) the Project Report.

(iii) marks secured at the final interview.

The number of students who appeared at the annual test, those who were called for interview and those who were finally selected gave a selection ratio of 11:3:1.

2.2 *The cut-off point for the first stage screening* : On the basis of previous experience, it was found that the probability that a student with a score less than 55% in science subjects at the high school stage will compete successfully in the final selection is less than 5% and hence it was decided that 55% should be the appropriate cut-off point. This also helps in making the number of students for the written test within reasonable limits of financial and administrative control. Some investigations are being conducted on this cut-off point which will throw more light on the effectiveness of the first stage of screening.

2.3 **The Science Aptitude Test** : This test is framed in such a way that it helps to discover the pupil's aptitude for science,

* his/her interest of pursuing science beyond routine curriculum;
* his/her powers of scientific reasoning;
* his/her ability to understand scientific concepts precisely;
* his/her ability to use the scientific approach in checking hypotheses and intrepreting data and in applying principles, and
* his/her capacity to judge assumptions and underlying conclusions.

The questions in 1966 test were divided into two parts i.e., A & B. Part A was compulsory and Part B optional. The compulsory part consisted of thought type questions of fourteen different areas of science viz., Physics, Chemistry,

Mathematics, Zoology, Botany, Astronomy, Physiology and Hygiene, Bio-Chemistry, Geology, Agriculture, Philosophy of Science, Engineering, Bio-Physics and Meteorology. Part B consisted of four sections viz., Physics, Chemistry, Mathematics and Biology. Each section consisted of 50 questions, of which 30 questions were of factual type and 20 were of thought type. The entire test was of three hours' duration and consisted of only multiple choice items of factual and thought type. The students were expected to answer all the questions in part A and the 50 questions from any one of the four sections provided in part B. Since the topics covered were of a very wide spectrum, the students were expected to have scientific comprehension beyond their routine curriculum. All the questions in this paper were of objective type with multiple choice form and with four alternatives provided to each question, out of which only one alternative was correct. Every student had to put a cross within the square opposite to the one correct answer in each question.

The number of thought type items in the test were 76% while that of factual type were 24%. This specific ratio was kept so that the test may be used for indentifying powers of comprehension, reasoning critical thinking and analysis-synthesis of the examinees rather than testing their factual knowledge. The items in each of the major areas were set by a panel of three setters drawn from universities or Centres of Advanced Studies, who had experience of framing objective type items. The pooled items in a particular area were than scrutinised by another expert in that very branch of knowledge. Since the number of items set by each setter were sufficient, it was not very difficult to select suitable number of items for the final form of the test. At some places suitable modifications were carried out in order to make the items fit for the final form.

Some sample items from the Science Aptitude Test 1966 are included in Appendix II. The scoring of this test was very simple because every correct answer carried one mark. However, in such a test, there is an element of guessing which was considerably reduced by using the following formula ;

$$\left(S = R - \frac{W}{N-1} \right)$$

where S=number of corrected scores,

R=number of right answers,

W=number of wrong answers, and

N=number of total alternatives provided in each item i.e. four in the present test.

Experience has shown that this objective type of scoring is more reliable and trustworthy because the various distractors provided in each question were made as plausible as possible.

2.4 **Essay type test** : There is a school of thought which believes that the objective type of items cannot measure adequately the powers of comprehension, organisation of thoughts and above all ability to express the thoughts in words. The age-old traditional tool of evaluation of essay type was also made use of in the present evaluative process with certain modifications. In this test, four titles were given and each student was required to write an essay on any one of the topics in about 2,000 words. The titles were chosen in such a way that they may cover some of the modern developments in science. The sample topics for 1966 have been included in Appendix III to give an idea about the nature of the questions asked.

2.5 **The Project Report** : Every participating candidate was required to submit a written project report on a scientific topic to be chosen by him/her. The project reports were either to be based on experiments carried out by the students on scientific topics or on observational data, its systematic analysis and interpretation. Through the reports, originality and scientific creativity of the students was to be judged. The students were given the option to take the necessary guidance from their science teachers for the completion of such a report.

Some of the written project reports of 1964, 65 and 66 have been published by the Department of Science Education so that these may provide guide lines to the future examinees. Some of the teachers in the remote corners of India could also develop an insight in this matter with the help of these printed project reports. Although many reports were of a routine nature, yet some indicated a high level of proficiency on the part of the examinees. One such report is included in Appendix IV.

2.6 **The Interviews** : On the basis of the written tests, 963 students were called for interview at Delhi, Dehradun, Bangalore, Bombay and Calcutta. The composition of the different borads is given below :—

Interview Board at Delhi

Chairman :—	Dr. D. S. Kothari Chairman, University, Grants Commission, U.G.C. Building, New Delhi.
Venue :—	University Grants Commission Building, New Delhi.
Dates :—	9th May to 13th May, 1966

Member Secretary :— Dr. R. N. Rai
Head of the Department of Science Education,
N. I. E. Building, Mehrauli Road,
New Delhi-16.

Members :— (i) Sh. P. D. Gupta
Principal, Ramjas College,
University of Delhi,
Delhi.

(ii) Professor B. M. Johri
Department of Botany
University of Delhi,
Delhi-6

(iii) Sh. S. S. Dube,
Head of the Deptt. of Chemistry,
Govt. College,
Kota (Rajasthan)

Interview Borad At Bombay

Chairman :— Professor V. G. Bhide
Professor and Head of the Deptt. of Physics
Institute of Science
Bombay.

Venue :— Institute of Science
Mayo Road, Bombay.

Dates :— 16th May to 19th May, 1966.

Member Secretary :— Dr. K. N. Saxena
Field Adviser
Deptt. of Science Education
N. I. E. Building, Mehrauli Road,
New Delhi-16.

Members :— (i) Sh. P. V. Parekh
Professor of Mathematics
Gujarat College, Ahmedabad.

(ii) Professor T. G. Khubchandani
Principal
Basantsingh Institute of science
Bombay-1.

(iii) Professor B. C. Haldar
Institute of Science
Bombay.

Interview Board at Bangalore

Chairman :— Professor P. L. Bhatnagar
Head of the Deptt. of Applied Mathematics
Indian Institute of Science
Bangalore-12.

Venue :— Indian Institute of Science
Bangalore-12.

Dates :— 18th May to 21st May, 1966

Member Secretary :— Shri Rajendra Prasad,
Field Adviser
Deptt. of Science Education
N.I.E. Building, Mehrauli Road,
New Delhi-16.

Members :—

(i) Professor M. Nagaraj
Central College
Bangalore.

(ii) Dr. P. Thirngnanasambandam
Chief Professor in Physics
Presidency College
Madras.

(iii) Sh. H. V. Srirangaraju
Deputy Director of Public
Instruction (examination)
Victory Hall,
Bangalore-1.

(iv) Professor V. Ananthanarayanan
Deptt. of Education,
Trivandrum.

(v) Dr. B.H. Iyer,
Professor in Organic Chemistry
Indian Institute of Science
Bangalore.

Interview Board at Calcutta

Chairman :— Professor B. D. Nagchaudhuri
Director, Saha Institute of Nuclear Physics,
Calcultta-9.

Venue :— Saha Institute of Nuclear Physics
Calcutta-9.

Dates :— 16th May to 19th May, 1966.

Member Secretary :— Dr. M.C. Pant
Deputy Director
Deptt. of Science Education
N.I.E. Building, Mehrauli Road,
New Delhi-16.

Members :—

(i) Sh. ch. Ibotombi Singh
Lecturer in chemistry, D.M. College
Imphal.

(ii) Professor S.R. Maitra
Head of the Deptt. of Physiology
University of Calcutta
University College of Science
Calcutta-9.

(iii) Professor P.K. Dutt
Asst. Director of Public
Instructions (Development) West Bengal.

(iv) Shri Rameshwar Prasad
Secretary
Bihar Secondary School Examination Board,
Patna.

(v) Shri D. L. Mukherjee
Senior Lecturer in Chemistry
D.M. College
Imphal.

(vi) Dr. J. Medhi
Head of the Deptt. of statistics
Gauhati University
Gauhati (Assam).

Interview Board at Dehradun

Chairman :—		Professor P. N. Mehra Head of the Deptt. of Botany, Punjab University, Chandigarh.
Venue :—		Doon School, Dehradun.
Dates :—		25th May to 28th May, 1966
Member Secretary :—		Dr R. N. Rai Head of the Deptt. of Science Education N.I.E. Buildings, Mehrauli Road, New Delhi-16
Members :—	(i)	Professor B.M. Johri Department of Botany University of Delhi, Delhi.
	(ii)	Professor S.C. Jain Head of the Deptt. of Physics Indian Institute of Technology Hauz Khas, New Delhi-16.
	(iii)	Dr. S. Saran Director State Institute of Science Education Allahabad.
	(iv)	Dr. H K.L. Gupta Office of Director of Education (Science Unit) Chandhigarh.
	(v)	Shri H.N. Chopra Principal Govt. College Chamba. (H.P.).

While awarding the overall marks, the performance of each candidate was judged on his/her scientific approach towards the acquisition of knowledge and its practical application. The members of the Board asked such questions which pertained to the project report work or about the scientific knowledge regarding the immediate environment. The following table indicates the States and Territories represented at each of the five boards :

S. No.	Venue of the Board	State/Territory represented
1.	Delhi	Delhi & Rajasthan.
2.	Dehradun	U.P., Punjab, J & K and H.P.
3.	Bangalore	A.P., Mysore, Madras, Kerala and Pondichery.
4.	Calcutta	West Bengal, Assam, Bihar and Imphal.
5.	Bombay	M.P., Maharashtra, Gujarat and Goa.

The allocation of the States/Territories to the various interview boards was done according to administrative facility and the number of examinees from the nearby areas. Wherever possible, lodging arrangements (free of cost) were made for the students who came from out side stations.

CHAPTER III

Selection Result

3.1 **The Merit List :** An analysis of the merit list (Appendix VIII) indicates that the maximum number of students were selected from the territory of Delhi. In all, 572 students appeared from this territory, 335 were called for interview and finally 150 students were selected from the total number. In West Bengal, 240 students appeared while 115 were called for interview and 60 were finally selected. Next in order of merit is the State of Uttar Pradesh, where 845 students appeared, 82 were called for interview and finally 33 were selected. It is surprising to note that from the State of Andhra Pradesh 204 students appeared for the test, 22 were called for interview and only 2 were selected. Similarly, from the State of Gujarat 56 students appeared for the test, 15 were called for interview and only five were selected for the award. From the State of Jammu & Kashmir 11 students appeared at the test, none was called for interview and hence not a single one was selected. From the State of Kerala, 141 appeared at the examination, 74 were called for interview and 13 were finally selected. From a very big State like Madhya Pradesh, 652 students appeared at the test, 55 were called for interview and 17 were selected. The above information gives a selection ratio of 26 per cent in the case of Delhi and 25 per cent in the case of West Bengal. In the case of Orissa, the selection ratio is 17.5 while in the case of Maharashtra this ratio is 10 per cent.

3.2 **The Value of Scholarship :** Prior to 1966, the duration of scholarship was tenable for a period of three years i.e., at Bachelors' level only. From 1966, it was decided that the rate of scholarship should be increased and the period should also be extended so as to cover the entire educational range from B.Sc. first year upto the end of the doctorate level. The revised scholarship rates were as follows :—

Rs. 100/- P.M. in the three years of B.Sc.
Rs. 250/- P.M. in the two years of M.Sc.
Rs. 350/- P.M. for the doctorate level work (for a period of four years.)

In addition to this, the awardees were also given the choice of purchasing books worth Rs. 100/- at the under-graduate stage ; Rs. 200/- at the Master's level and Rs. 350/- at the doctorate level. The revised scheme also included the selection of some outstanding institutions in India where the awardees could be admitted at the Bachelor's, Masters' and doctoral levels. In addition to this placement they were also required to be attached to senior teachers in the concerned faculty who could give personal guidance to the awardees. Those of the students who were required to join the selected institutions from outside their home towns, were expected to live in an approved hostel so that the overall education did not suffer. This complete change in the conditions of the

award brought forth a new life to the Scheme because it was now clear that every awardee has the option of starting his/her education from B.Sc. first year and should continue the same upto the end of the doctorate level, provided he she secured a first class at the end of the Bachelor's and Masters' degree. Secondly, the inter-personal relationship between the scholars and the teachers was expected to bring about better education both from the content point of view and from the point of view of the development of the overall personality.

3.3 **Follow-up of the awardees :** Detailed cumulative record card in respect of each of the awardees was prepared in order that it may incorporate the essential bio-data, academic progress and other extra curricular details. These record cards will form an important tool of the follow-up programme. It will not be out of place to mention that very often relevant details are not easily available inspite of the best efforts because of many obvious reasons.

Another important programme connected with the follow-up of the awardees is the organisation of summer schools. This year, 16 Summer Schools were held at New Delhi, Udaipur, Poona, Madras, Calcutta, Bombay and Bangalore. The main objectives of the summer schools were to establish inter-personal relationship between the teachers and the taughts and also to motivate the experimental curiosity of the scholars so that they may utilise their potentialities to their best advantage. At most of these summer schools, project work was considered to be a very important aspect for bringing about better education on lines of creativity and scientific experimentation. In addition to the above objectives, the participants were also introduced to the new developments in the various fields of basic sciences. This type of exposure is very limited under a routine scholastic situation, existing at most of the institutions of higher learning.

3.4 **Proposals for the Qualitative Improvement of the Scheme :** In order that this National Scheme can prosper scientifically, some research studies have to be carried out and interpreted. Some of these research projects have been suggested in Appendix No. XIII. Out of these, some projects have already been udertaken e.g., finding out correlation between the Science Aptitude Test and the Progressive Matrices Test ; to find out the correlation between the corrected and uncorrected scores, in case the formula for guessing is applied ; to find out whether the distractors provided in each item are equally attractive and plausible or not ; to find out whether there is a change in the ranking in case the raw scores are converted into standards scores ; to determine the efficiency of the initial cut-off point i.e. whether it should be 55%, or lower or higher.

From the sample research stated above, it will be clear that efforts are being made to conduct a scientific investigation into the various aspects involved in the functioning of the Scheme. The empirical and the predictive validities of the tests have also been worked out.

CHAPTER IV

Accelerated Programme for the Awardees

4.1 **Education of the Educationally Advanced Children :** It is an admitted fact that bright students cannot be sacrificed at the altar of the mediocres or the slow learners. It is also an admitted fact that if we do not provide challenging educational and extramural programmes to the educationally advanced children, their intellectual development and growth will not be commensurate with the extensive faculties that they possess. Therefore, it is very necessary to provide adequate opportunities to the bright students in and out of the school.

4.2 **Possible Alternatives :** One of the important means of educating the academically bright students is to put them in separate institutions with fairly high quality staff. But segregating children from the peer group is not a very happy solution in a democracy. The second way is to organise classes out of the school for the bright students This requires great devotion on the part of the teachers and also sustained motivation on the part of the students.

Another alternative is to keep talented children in a special class during a part of the institutional hours of work. This alternative requires considerable efforts and attention on the part of the staff members. It will also require framing of two different types of curricula : (i) for the educationally gifted and (ii) for the mediocres and slow learners.

The most probable solution, considering the conditions at hand, seems to be that the talented group should get individual attention from the teachers and at the same time should be allowed to work in the long vacations on some useful academic projects. Past experience has shown that the organisation of a network of summer schools has been very fruitful and has provided sufficient inspiration to the resource persons as well as to the participants.

4.3 **The Follow-up of the Accelerated Programme :** As already pointed out the most important function of this National Scheme is to follow-up the academic career of the awardees in and outside the institution. This can be achieved only when they were admitted to some selected institutions and are allowed to work under the guidance and supervision of a selected team of academic workers. One of the important accelerated programmes is the organisation of summer schools, which brings about a very desirable effect on the total behaviour of the young students. Equally important is the follow-up of the detailed contacts developed at such schools. This will bring about a closer relationship between the experts and the awardees. This can be done if the participants are encouraged to keep continued contacts with the Directors and the resource persons of the summer schools.

Some details regarding the summer schools organised during 1966 are given in Appendix I, which clearly indicates that it is possible to motivate the academically bright students to channelise their energies into fruitful academic and social channels.

It is hoped that besides the organisation of the summer schools, the appointment of individual guides and placement of scholars will help to maintain closer inter-personal relationships between the awardees themselves. This step will be of great use not only to the participants but will also help the sponsors of the National Science Talent Search Scheme to make suitable modifications in their extensive programme.

CHAPTER V

Parallel Schemes in India and Abroad

5.1 **Science Talent Search Scheme of U S A.:** In the 1965 Report we have already made very detailed comments about the Westing House Science Talent Search Scheme of the United States. As will be evident from the accounts already given, this Scheme provides an opportunity for the brilliant students to come forward and compete in a test which finally judges their intellectual capacities and scientific aptitude. We also quoted some items from the Westing House Science Talent Search examination held in different years because the multiple choice items, as included in the test, can help our teachers to understand what is being done in other countries. We have included some more questions this year also.

5.2 **Sample items from the science aptitude test of the Westinghouse Science Talent Search Scheme Directions:** Four possible answers are given for each question. Choose that answer which is most nearly correct. Record your answer by putting an X in the answer.

Factual Type

1. Hemophilia is a hereditary disorder characterized by

   1. delayed clotting of the blood ☐
   2. rapid increase in the white cell count ☐
   3. severe anemia ☐
   4. too rapid clotting of the blood ☐

2. Tornadoes occur most commonly between ☐

   1. midnight and 6 a.m. ☐
   2. 6 a.m. and 12 noon ☐
   3. 12 noon and 6 p.m. ☐
   4. 6 p.m and midnight ☐

3. A faraday is a unit of quantity of electricity, the flow of which results in

   1. analyzing the constituents of an eutectic mixture ☐
   2. depositing one gram-atomic weight of metal on an electrode ☐
   3. determining the isotopic structure of a compound ☐
   4. performing catalytic hydrogenation of organic compounds. ☐

4. Recently it was reported that a radar signal had been sent from the earth to the sun and back. About how long would such a signal take to go from the earth to the sun and return ?

   1. 17 seconds
   2. 17 minutes
   3. 17 hours
   4. 17 days

5. An area 600 miles wide and 800 miles long received a snow-storm averaging the equivalent of one inch of rain. If this moisture were all drained into a lake 50 feet deep, about how many square miles would the lake cover ?

   1. 500 square miles
   2. 800 square miles
   3. 1,100 square miles
   4. 1,400 square miles

6. A maxwell is

   1. a cgs unit of magnetic flux
   2. equal to one BTU per hour
   3. equal to one newton per square meter
   4. a dosage unit used for antibiotics

7. Which one of the following is not a stage in the development of the crab ?

   1. egg
   2. megalops
   3. pupa
   4. zoea

8. Which of the following animals is a ruminant ?

   1. elephant
   2. giraffe
   3. hippopotamus
   4. zebra

9. At what time of year does the Perseid meteor shower occur ?

   1. autumn
   2. spring
   3. summer
   4. winter

10. What is the total number of "rare earth" elements ?

1. 6 ☐
2. 9 ☐
3 12 ☐
4. 15 ☐

Thought Type

Section A

Photographic developers are chemical solutions containing a number of different compounds so proportioned as to produce the controlled reduction of exposed silver halide grains During reduction, the exposed silver halides are reduced ro metallic silver, the invisible latent image formed by exposure being converted into a silver deposit or visible image. Developing solutions normally contain components which can be classified according to their functions into the following heads :

Developing agents
Preservatives
Activators
Restrainers

Occasionally developers are encountered which contain less than four components. In these cases, one of the components exhibits more than one function. In other cases additional components are added according to the result desired.

Questions on Section A

1. We may see the image on exposed photographic film by

   1. holding it upto a light [ ]
   2. reducing all the silver halides [ ]
   3. reducing silver halides struck by light ☐
   4. reducing some of the silver halides ☐

2. All photographic developers

   1. are virtually identical ☐
   2. have at least 3 components ☐
   3. have separate developing components ☐
   4. produce a metalic image ☐

Section B

There are a large number of implications and uses of animal sonar devices. The use of ultrasonic cries for echolocation by the bat is well known, if not yet fully understood. Its precision, speed, and freedom from interference make this a profitable system for study by the physicist, not only for military purposes but as an aid to the blind. The sensitivity of the moth's ear in intercepting hostile bat sounds is of great value.

The sonar system of porpoises and whales has been little studied, but evidence indicates that they have a highly developed and accurate location sense combined with a high degree of intelligence and ability to communicate. An institute is now being formed in the Virgin Islands dedicated to the study of these animals.

Other animal sensing devices are perhaps less well known but appear to the practical-minded to have equal potentialities. Many fish have electro-receptors which they use to detect obstacles. These fish emit pulses of low voltage with frequencies characteristic for each species. The frequencies may range from 50 to 1600 cycles per second. The alteration of the pattern of the electric field as a result of objects, apertures, or other fish in the surrounding water can be detected. So sensitive is this response that the fish will respond to the movement of electrostatic charge produced by waving a comb (that has been run through one's hair) in front of the aquarium. They can differentiate between a conductor and a non-conductor or respond to the presence of a stationary magnet outside the aquarium.

The rattlesnake is equipped with exquisitively sensitive temperature receptors. These receptors will respond to an increase or decrease of 10^{-6} calorie (small) in 0.1 second, which represents a change in tissue temperature O.001°C. Expressed in terms of a temperature quotient of Q_{10}, the frequency of nerve impulses in a single fiber is 10^{30}. When two balls of equal size differing minutely in temperature are presented to the snake, it will invariably and unhesitatingly strike at the warmer.

Questions of Section B

3. Certain fish can be expected to differentiate between the two items in which one of the following groups ?

   1. grass and copper
   2. gold and aluminum
   3. rubber and wood
   4. wool and leather

4. The sensitivity of the moth's ear in intercepting hostile bat sounds would be most related to the area of :

   1. computor development ☐
   2. electronics ☐
   3. microphonics ☐
   4. missile detection ☐

5 The highly effective sonar system o porpoises and whales result from the :

   1. disturbing effects produced by atmospheric electric phenomena in the surroundings ; ☐
   2. high-frequency vibrations which are reflected back from object ; ☐
   3. rapid chemical decomposition of their environs by the action of electric currents ; ☐
   4. wave properties of electrons in passing from a point of low potential to a point higher in potential ☐

6. The receptors of the rattlesnake respond to an increase or decrease of 10^{-11} (small) calorie (amount of heat required to raise one gram of water 1°C) in 0.1 second. If one were interested in the increase or decrease of the large calorie (the amount of heat required to raise one kilogram of water 1°C), it would be necessary to multiply by

   1. 1,000,000 ☐
   2. 1,000 ☐
   3. 100 ☐
   4. 10 ☐

5.3 It will not be out of place to mention that one of the pioneer Schemes in India was started as early as 1960 under the title of Jagdish Bose National Science Talent Search Scheme to locate scientific talents after the secondary stage of education. We have already included the details of this Scheme in the previous issue. For the guidance of the research workers some sample items have been included from this pioneer Scheme also.

PART A

Section A

Premise : The upper region of the mesophyll in a leaf consists of three layers of cylindrical cells whose long axes are at right angles to the epidermis. This forms the palisade parenchyma. Narrow intercellular spaces run in

between these cells. The lower part of the mesophyll consists of irregular cells which are loosely arranged and thus leave large intercellular spaces. All the intercellular spaces communicate with each other and with the stomata which are absent in a upper surface of the leaf. The cells of the mesophyll contain numerous chloroplasts. The palisade tissue is concerned chiefly with photosynthesis. The spongy tissue also discharges this function but its importance lies in its intercellular-space system for free diffusion of gases and water vapour between the plant and its environment through the stomata.

Questions on Section A

1. Put X in parentheses against statement or statements which you consider most nearly correct.

(a) the upper surface of a leaf is darker green in colour than the lower surface because of the presence of palisade tissue ;

(b) the lower surface of a leaf is darker green in colour than the upper surface because of the presence of palisade tissue with numerous chloroplasts ;

(c) narrow intercellular spaces run between the large irregular cells at the lower surface of a leaf ;

(d) narrow intercellular spaces run between the cells of the palisade tissue which is concerned chiefly with photosynthesis.

2. Indicate by putting the appropriate symbol in parentheses against each of the statements whether it is true (Symbol is T) or false (symbol is F).

(a) stomata are present in the palisade tissue;
(b) stomata are present in the spongy tissue;
(c) stomata are present in the lower surface of a leaf;
(d) stomata permit diffusion of water vapour between the plant and its environment.

3. Put X in parentheses against the statement or statements which you consider absurd

(a) the large intercellular spaces of a leaf contain numerous chloroplasts;
(b) the large intercellular spaces of a leaf contain gases and water vapour for diffusion;

(c) the long axes of the cells of the palisade tissue are arranged at right angles to the epidermis;

(d) irregular cells of the spongy tissue are arranged at right angles to the epidermis.

Section B

Premise : The equivalent of an element is generally defined as the weight of the element which combines with, or displaces, one part by weight of hydrogen, or the equivalent of any other element.

Hydrogen, being the lightest of all elements, is taken as the standard for equivalent and atomic weights. The equivalent of hydrogen is, therefore, taken as unity.

The valency of an element is given by the number of hydrogen atoms, or equivalent thereof, with which an atom of the element combines. Hence the valency of an atom is equal to the ratio of its atomic weight and equivalent weight ; in other words,

$$\text{valency} = \frac{\text{atomic weight}}{\text{equivalent weight}}$$

The atomic weight of a few elements are given below :
C=12 0, O=16 0, Cl =35 5, Hg=200.0

One part by weight of hydrogen combines with three parts by weight of carbon in methane, four parts in ethane, six parts in ethylene, and twelve parts in acetylene

The formulae of methane, ethane, ethylene, and acetylene are CH_4, C_2H_6, C_2H_4 and C_2H_2 respectively.

100 gm of mercury combines with 8.0 gm of oxygen to form mercuric oxide and with 35.5 gm and 17.75 gm of chlorine to form mercuric chloride and mercurous chloride respectively. The equivalent weight of oxygen=8.0 and that of chlorine=35.5.

Questions on Section B

Put X in parentheses against the statement or statements which you consider most nearly correct, or most appropriate in the following three questions.

4. (a) the equivalent weight of carbon is 3,
   (b) the equivalent weight of carbon is 4,
   (c) the equivalent weight of carbon is 6,
   (d) the equivalent weight of carbon is 12,
   (e) the equivalent weight of carbon may be 3, 4, 6 & 12.

5. (a) the valency of carbon is 4,
   (b) the valency of carbon is 3,
   (c) the valency of carbon is 2,
   (d) the valency of carbon is 1,
   (e) the valency of carbon may be 1, 2, 3 & 4.

6. (a) the equivalent weight of mercury is 100 and its valency is 2,
   (b) the equivalent weight of mercury 200 and its valency is 1,
   (c) the equivalent weight of mercury may be 100 and 200, and its valency 2 and 1.

Section C

Premise : We know that friction plays an important part in the mechanical problems of ordinary life. If there be no friction between our shoes and the ground, we would not be able to walk, and if there be no friction between the ladder and the ground, the ladder would not rest in any position inclined to the vertical. The underlying principle is that "to every action there is an equal and opposite reaction". The same principle also holds good when a cannon, free to move on a pair of horizontal rails, recoils as it is fired.

Questions on Section C

7. Can an aeroplane fly in airless space ?
   (a) yes
   (b) no

8. The type of vehicle which can fly in airless space is a
   (a) balloon
   (b) zeppelin
   (c) dakota
   (d) rocket.

9. Wearing perfectly smooth shoes you are left standing in the middle of a perfectly smooth and horizontal sheet of ice. You can step off the ice by :
   (a) jumping forward
   (b) jumping upward
   (c) jumping sideways
   (d) puffing out air horizontally.

Section D

Directions : The following premise illustrates the role of hypothesis in discovery. It is followed by five statements each of which stands for one question.

Indicate your opinion by putting the appropriate smybol against each of the following five statements whether the text of the premise supports it (symbol is Y) or does not support it (symbol is N) or it is not relevant (symbol is NR)

Premise : The role of hypotheses in research can be discussed more effectively if we consider first an example of discovery which originated from hypotheses. A good illustration of such a discovery is provided by the story of Christopher Columbus. It has many of the features of a classic discovery in science.

Columbus was obsessed with an idea that since the world is round, he could reach the Orient by sailing west The idea was by no means original, but evidently he had obtained some additional evidence from a sailor blown off his course who claimed to have reached land in the west and returned. He met great difficulties in getting someone to provide the money to enable him to test his idea as well as in the actual carrying out of the experimental voyage. When finally he succeeded he did not find the expected new route, but instead, found a whole new world. Despite all evidence to contrary, he clung steadfastly to his hypothesis and believed that he had found the route to the Orient. He got little credit or reward during his life time and neither he nor other realized the full implications of his discovery. Since his time, evidence has been brought forward showing that he was by no means the first European to reach America.

Questions on Section D

10. it is not necessary to cling to fixed ideas when pursuing a scientific object;

11. it is necessary to observe intellectual discipline of subordinating ideas to facts;

12. it is important to shun misconceptions;
13. it is important to examine ideas critically;
14. hypotheses are the principal intellectual instruments in research.

PART B (THOUGHT TYPE)

Directions : A number of answers are given for each of the following two questions. Put X in parentheses against the answers you consider most nearly correct in order to complete each statement.

15 Red colour of a flower is due to the presence of :

A. chloroplast
B. anthocyanin
C. leucoplast

16. The principal food produced directly by the plant from carbon dioxide of the atmosphere in the presence of light is :

A. vitamin
B. carbohydrate
C protein

17. Put X in parentheses against the particular tissue out of those listed below, which you consider as mainly responsible for increase in growth of a plant by cell division.

A. endodermis
B. cortex
C. cambium
D. pericycle

18. Indicate by putting the appropriate symbol in parentheses against each of the items listed below whether it has simple (symbol is S) or compound (symbol is C) leaves.

A. paddy
B. mango
C. coconut
D. rose

Section 2

Directions : A number of answers are given for each of the following six questions. Put X in parentheses against the answer you consider most nearly correct in order to complete the sentence in each question.

19. The theory of electrolytic dissociation was first formulated by :

A. Farady
B. Ostwald
C. Arrhenius
D. Van't Hoff
E. Berthellot

20. The weight of potassium dichromate required for preparing one litre of its normal solution for titrating a solution of ferrous sulphate, is

A. equal to its formula weight;
B. equal to half its formula weight ;
C. equal to one-sixth of its formula weight.

21. The element, which occurs in all proteins but not in carbohydrates, fats or oils, is:

    A. Sulphur
    B. Nitrogen
    C. Carbon
    D. Oxygen

22. The volume of oxygen required for the complete combustion of one litre of acetylene, both measured at standard temperature and pressure, is.

    A 3.5 litres
    B. 3.0 litres
    C. 2.5 litres
    D. 2.0 litres

23. The weight of a piece of pure marble ($CaCO_3$ -100) that will be completely dissolved by 50 ml of normal hydrochloric acid, is

    A. 5.0 gm
    B. 4.5 gm
    C. 3.5 gm
    D. 2.5 gm

From the discussions given above, it will be evident that it is possible to find a common criteria of judgement for evaluating scientific aptitude The important feature will be the different types of questions asked by different agencies. An exchange of ideas and of the academic materials between the various agencies will be an ideal solution to work out a concentrated programme of searching scientific talents for the benefit of the developing countries.

CHAPTER VI

INTER-PRETATION OF THE DATA

6 1 AREA WISE DISTRIBUTION OF ITEMS ON SCIENCE APTITUDE TEST :

On a perusal of Appendix (V) it will be clear that the number of items included in the Biology section were more as compared to the number of items framed in Physics, Chemistry & Mathematics sections viz., 7 in each of the latter 3 sections while 9 in Biology section. The other 9 branches of science had 5 questions each Low weightage to the interdisciplinary 9 branches of sciences is because these areas are not included in the curriculum of the secondary Boards Thus in all there were 75 thought type questions covered by these 14 branches of sciences. The questions were of multiple choice type arising out of thought provoking passages full of scientific information Four alternatives were provided in each question. This set of 75 thought type questions constituted Part A (compulsory) of the test.

In Part B (optional) of the test, there were four sections, viz , Physics, Chemistry, Biology & Mathematics. An examinee was to choose one of the sections depending on his taste in a particular branch of basic science. Each of the four sections consisted of 30 factual type items and 20 thought type items. The questions were set in the multiple choice form with four alternatives to each question. Thus the number of thought type items (76 ,) were slightly more than three times as compared to those factual type items (24 ,) because it was felt that the former type of items were more suitable to spot talented students. A perusal of Appendix-XIV will make it clear that 79.4 ,, of the thought type items and 78.4% of the factual type items were selected on the basis of difficulty and discriminative values On the whole, one can empirically judge, with such objective type of test the ability and interest in a particular branch of science of an awardee.

6 2 DISTRIBUTION OF THOUGHT-TYPE ITEMS INCLUDED IN THE SCIENCE APTITUDE TEST :

Appendices VI (A) & VI (B) indicate the various sections together with the number of passages and the number of items extracted from those passages under each area. The last column of appendix VI (A) and VI (B) gives the average number of the items per passage. There seems to be a wide variation amongst the paper setters in this respect. The number varies from 1.0 to 5 0. On an average the number of items per passage is 2.2 approximately in part

A (compulsory) of the test, whereas in Part B of the test the average number of items per passage for different sections is indicated in appendix VI (B). The variation explained above may be due to many reasons, like the read-ability of the passages from different subject areas, abstract nature of the subject matter etc. This may also be due to the fact that there are some areas where extraction of items (which can judge critical thinking and scientific reasoning together with the use of higher mental powers) is very difficult and hence the average number of items per passage for such areas is as low as 1.0 and 1.25 e.g. in philosophy of science and in agriculture. Mathematics and in some particular branches of Physics, and Biology the culling of items is very easy, that is why the average number of items per passage are 5.0, 3 5 and 3 respectively. In case of mathematical problems, if we introduce the idea of inverse functions then culling of items can be upto 10 or even more.

6.3 ANALYSIS OF THE MERIT LIST :

In Appendix (VII B) is given the analysis of the merit list taking six slabs of 50 ranks each and the last slab of 54 ranks (in order of merit) to indicate the educational courses opted by the awardees. Amongst the first 50 students, 28 joined basic sciences, 13 joined engineering and technological courses & none opted for other professional courses Out of the top twenty awardees, 10 have joined basic science courses and only 5 have joined engineering courses. The usual impression that top meritorious students are more likely to go in for engineering, technological or medical courses is not borne out by the present data. Rather there seems to be a tendency for the brilliant students to opt for basic sciences in preference to the technological or or medical courses. In the next batch of 50 students, 32 have opted for basic science courses, and 5 for engineering & technological courses. In the last slab of 54, 36 students have joined basic sciences, while 10 have taken up engineering and technological courses.

Out of the top 100 students 60% have joined basic science courses while in the middle group 63% and 62% have joined in the third group of 100 students 19% of the students in the top group have joined engineering and the professional courses. This figure is 14% in the middle and 20% in the third group. In the last slab of 54, 36 have joined basic science courses and 10 have joined technical courses.

Therefore, there is no marked tendency for the bright students to go in for engineering or the technological or allied professional courses.

On the whole, 62.0% students have joined basic sciences, while 18% have joined engineering or other professional courses. This bias in favour of basic

science courses may be due to the specific aptitude of the students, facilities extended, and the pre-conditions laid down in the specific scholarship scheme as well as the pre-conditions of admission to the various institutions in the country.

6.4 STATEWISE DISTRIBUTION OF THE EXAMINEES AND THE AWARDEES :

It will be evident from the Appendix VIII that there is a wide variation amogst the States in respect of number of male and female students taking the Science Talent Search Examination. This reflects that :

(1) the total number of students in class XI or an equivalent stage in different states is different ;

(2) publicity of the Scheme in all the states might not have been uniform some states and Union Territories like Delhi, U.P., M.P. and M.S. have sent an appreciable number of students to take these tests ;

(3) there may be a wide variation amongst the states and the territories with regard to the number of students with 55 % marks in science subjects in class X (or an equivalent class) ,

(4) it is a fact that in some states the facilities for professional courses are so adequate as to accommodate all the bright students, leaving very little incentive for them to go in for basic science courses.

Columns 8 and 9 give the statewise selected boys and girls elipible for the award. Their overall selection ratio is 8.5% and 9.5% (taking into consideration the total sample of boys and girls) or 36.5% and 37.5% (taking into consideration both boys and girls called for interview).

Appendix (IX) column (5) gives the statewise selection ratio (in percentage) at the first stage of selection, viz., those eligible for being called for interview on the basis of marks obtained in theory papers.

It will be interesting to note that these selection ratios for the territories of Panjim, Delhi and States of Kerala, West Bengal and Orissa are higher than other states and territories indicating that probably only those students were sent for the tests who were high achievers. In the states of Rajasthan, M.P., U.P., A.P. and Madras the selection ratios are comparatively low indicating that the selected students who appeared at the tests (those having marks 55% and above in Science subjects in the preceding class) have probably not been able to show matching critical thinking and scientific comprehension as could have been expected on the basis of their academic achievements (as reflected by school marks). This indicates that :—

(1) the scientific studies in these States have not been oriented to incorporate the recent developments in sciences ;

(2) the school marks in these States reflect a rote memory knowledge rather than wide spectrum of scientific comprehension based on critical thinking and reasoning ,

(3) the teaching in these States may be more oriented to prepare students for public examinations demanding rote type of selective learning rather than developing scientific concepts, creativity and critical thinking ;

(4) the cut-off score of 55% reflects different standards of cognitive abilities in different states and territories ;

(5) the system of examination is different in different states.

A perusal of Column 7 giving the final selection ratios, indicates the slight ups and down in the relative positions of the State's performance in comparison to their relative positions in column (5). States like W.B., Orissa, M.S. and Gujarat have shown some improvement, and alongwith other States like Mysore, Kerala and Delhi territory show more impressive results than U.P., M P., Bihar and Madras.

The plausible reasons for comparatively good performance from Delhi (in addition to those quoted above) may be that :

(1) the students in Delhi have an advantage over others in having better library and laboratory facilities in addition to better experimental methods of teaching The curriculum is also rich in content matter;

(2) there may be some familiarity with objective type tests amongst Delhi students because of the Pilot Project of 1963 and 64 & 65 examinations ; to compensate for this relative disadvantage of the students from other States, the Department of Science Education has sent copies of the 1964 & 65 test papers to all the States and Territories so that the teachers and students may get an idea of the type of tests that they can expect;

(3) these students have added facilities of television lessons and having well qualified science teachers, mostly post graduates;

(4) the students are exposed to better extramural activities. Column No. 8 indicates the percentage distribution of the awardees in the different States. All the participating States have received a few scholarships, although territory like Delhi has taken a chunk out of the total number. It may be noted that the awards were made on an All India basis and no state/territory quota was fixed. However, one feels that from the States like U.P., Bihar and Madhya Pradesh, where the student population is quite large and much more than

that in Delhi, a larger percentage could have competed successfully in case their teaching and learning standards were comparable with those prevelent in Delhi. In order to have the over all picture of the statewise distribution of awardees selected in the N.S.T.S Examination year 1966 and the number of examinees from various states, histogram has been enclosed in the aforesaid Appendix

In Appendix (X) a comparative study of the statewise distribution of the awardees in the different years of N.S.T.S Examination (i.e. 1964, 65 & 66) with that of National Scholarship Scheme of the Ministry of Education has been given. It may be observed that Delhi, W.B., & M.S. States are deriving the maximum benifit out of this scheme.

6.5 INTER-BOARD VARIATIONS IN THE DISTRIBUTION OF SCORES ON THE DIFFERENT TESTS :

Appendix (XI) gives the mean, standard deviation and a measure of skewness (in case of Interview & aggregate scores only) of the scores, together with their standard errors for each of the interview boards. It also gives the frequency distribution of scores board-wise and test-wise. The average score in Science Aptitude Test varies from 56.5 to 66.87 while the pooled mean is 62.60. It is interesting to note that barring Delhi Board average scores on the rest of the 4 boards are not much different. The average score on essay paper and project report varies from 23.28 to 28.37 and 9.82 to 11.63, whereas their respective pooled means are 24.6 and 10.36. It has been observed that on the essay paper, the average scores on the five boards (excepting that of Dehradun) are almost homogeneous and in the distribution of scores of project report, the average for the different boards are again homogeneous.

However, with regard to the Interview scores, the average score varies from 8.05 to 24 30, while the pooled mean is 16.40, indicating a wide hetrogeneity of scores scored by the candidates at the various interview boards. The inter-regional variations can be attributed to the heterogeneity of various factors obviously present at the different interview boards. The average score at Bombay Board is the highest while that at Bangalore is the lowest, inspite of the fact that the students at Bangalore Board have done well at the theory tests This may be because of the more rigorous norms adopted at the Bangalore Board, which is supported by the measure of skewness ($\sqrt{\beta_1}$ 1.88 the highest in comparison to that of other boards), while in case of Bombay Board we can say that the marking was not at all stiff, because of $\sqrt{\beta_1}$ =0.03 (lowest). Despite the fact that Delhi Boad students have done well at the theory tests, they have recorded comparatively lower average score on the interview. This may be due to the same reason explained above. This indicates that effective steps should be taken to structure the interview on sound lines and to increase the reliability of the interviews. It seems desirable to re-scale the interview marks on the basis of theory marks or to convert the various scores into standard scores.

In aggregate scores Bangalore Board records the lowest average (102.65) while the Calcutta Board records the highest (116 0). It indicates that the overall performance of the students at the Calcutta Board is superior to those of other boards. But the inter range is small in comparison to that of the preceding years. Thus giving an impression that there is no marked variation in the over all performance among the students at various boards (i.e. they lie within the interval 102.65 to 116.0).

From the histograms A(I-V) of Appendix XI B it appears that the distribution of Science Aptitude Test scores is positively skewed in case of all the Boards, but the degree of skewness in case of Delhi and Bangalore Boards appear to be much less in comparison to that of other Boards.

The distribution of the essay marks from histograms B (I-V) is more or less indentical at all the Boards, except the Dehradun Board, where the coefficient of variation is much less than that of other Boards, meaning thereby that the students interviewed at Dehradun Board were consistent in their abilities in respect of scoring marks in the essay paper. The distribution of scores on the project report is on the whole, positively skewed and the pooled average score is 41.4%.

The distribution of scores on the interviews is positively skewed for all the Boards.

Most of the scores seem to cluster round the lower class intervals indicating that strict marking was adopted at almost all the places except at Bombay Board. Regarding the distribution of composite scores, on the whole, it is positively skewed. The distribution of scores at all the Boards seem to be platykurtic. This is because the composite scores are the aggregate scores, having different means and standard deviations.

Rank order of various boards based on the average score in different papers:

Rank/ Papers	1st	2nd	3rd	4th	5th
S.A.T.	Delhi	Calcutta	Bangalore	Bombay	Dehradun
Essay Paper	Dehradun	Bangalore	Bombay	Delhi	Calcutta
Project-Report	Calcutta	Bombay	Dehradun	Bangalore	Delhi
Interview	Bombay	Calcutta	Dehradun	Delhi	Bangalore
Total-Marks	Calcutta (46.4%)	Bombay (46.0%)	Delhi (45.8%)	Dehradun (43.7%)	Bangalore (41.0%)

On a perusal of the following table (showing $Z=\frac{X-\bar{x}}{S.D}$ scores which is

maximum for Calcutta), we draw the conclusion that the students of Calcutta Board are consistent in their abilities as shown by these four selection tools of the N.S.T.S Examination.

Boards/ Papers	Bangalore Actual score in %age	Bombay Actual score in %age	Calcutta Actual score in %age	Delhi Actual score in %age	Dehradun Actual score in %age
S A.T	49.0(—0.063)	46 2(—0.239)	50.6(+0.038)	53.6(+.207)	45.2(—0.302)
Essay-Paper	50.0(+0.100)	47.6(—0.201)	46.5(—0.240)	47.3(— 239)	56.6(+0.932)
Project-Report	40.7(—0.176)	43.0(+0 402)	46.5(+1.285)	39 3(—.529)	41.4(0.00)
Interview	16.0(—1.797)	48.6(+1.69)	39.0(+0.663)	31.5(—.139)	33 3(+0.021)
	—1.936	+1.651	+1.726	- -0.800	+0.651

where bracketed figures indicate the corresponding "Z" score of the actual scores.

6.6. A FOLLOW UP STUDY OF 1964 AND 1965 AWARDEES WHO JOINED BASIC SCIENCE COURSES.

Appendix XII gives the correlation between the total of the Science Talent Search Examination & Physics, Chemistry, Mathematics and the total marks secured at the Higher Secondary, at B. Sc. Part I examination and at B. Sc. Part II Examination by the students who were awarded scholarship under the science talent search scheme during 1964 and 1965. Inspite of the following facts : -

(a) unreliability of the essay-type examination in various institutions;

(b) differences in the educational standards of the various institutions,

(c) different norms adopted implicitly by the different institutions in the country to measure the academic achievements, we find that all the correlations except, that of tables No. 16, 14, and 11 are significant at 0.05 level, but low. This is due to the fact that we are correlating the marks scored on comparatively reliable objective and allied type of tests with those scored on unreliable and purely subjective type tests (i.e. traditional achievement tests). Keeping this in view not much reliability can be attached to the correlational figures obtained herein.

On a perusal of the correlational figures in the tables No. 1, 2, & 3 (indicating the degree of association between the S.T.S. total marks and the total marks in Science subjects, (viz., Physics, Chemistry, Mathematics and

Biology at Hr. Secondary, at 1st year and 2nd year of the three years degree course scored by the awardees of year 1964), it is clear that the correlational figures are low and are decreasing in the successive years.

In case of the 2nd year of three years' degree course, the figure is 0.24. though significant but is low as compared to the preceding years, which may be due to one of the reasons explained above. So far the decreasing of figures is concerned it may be due to :

(a) decreasing of the sample size in the successive years, which may be due to a drain to professional courses ;

(b) lack of follow-up data supplied due to non-seriousness of educational institutions towards the scheme ;

(c) complete reversal of the objectives of talent search and nurturing thereof ;

(d) lack of facilities for genuine research work as against routine, scholastic hardpressed situations prevelent in institutions of higher learning ;

(e) system of evaluation being too non-flexible, invalid and unreliable ;

(f) lack of motivation on the part of the awardees to adjust to the routine scholastic situations at centres of higher learning.

6.7 ITEM ANALYSIS OF SCIENCE APTITUDE TEST

In order to judge the suitability of the different test items, a detailed item-analysis has been carried out, which is reported in Appendix (XIV A-E).

The top and bottom groups constituted upper and lower 27% candidates emerging out of a stratified proportionate sample of size 400. The discriminative and difficulty values have been calculated from the item-analysis chart by A.E. Harper, B. Dass Gupta and S. P. Sangal.

It will be noted that on basis of the difficulty values and discriminating power of items (taking a cut-off point at 15 for discriminating power and difficulty level between 20 to 65), 22% of the items of factual type, 20% of thought type and 20.5% of the total items in both parts of the test have been rejected mostly in areas of Physics, Chemistry, Biology, Mathematics and Astronomy. In case of non-curricular (excluding Astronomy) subjects, the rejection is only 40% of the total rejected items, whereas, the over all rejection of items in compulsory part of the test is 20%, thereby giving a general impression that the high achievers have better acquaintance with these new areas, (especially in Geology, Physiology and Hygiene, History and Philosophy of Science, Bio-Chemistry and Agriculture where all the items are discriminative) while the low achievers do not possess it.

It will be noted that items on Chemistry, in both the parts of the test, are mostly non-discriminative. One plausible reason for this can be that the content matter of Chemistry mostly consists of rote memory and hence it is really difficult for high and under achievers to be distinguished on higher mental powers. The next group of items which are non-discriminative belong to the area of Engineering, Physics, Astronomy and Meteorology. There is no significant difference between the number of correct items in the top group and the bottom group of the abovestated areas. A few items with difficulty index beyond 65 have also been taken because of the content validity. Applying the rigid criteria of selecting items, 217 items have been found to be suitable for future use. Since the tool has been found to be highly reliable (r 0.89), it can be hoped that the pool of items can safely be used by the Secondary Examination Boards of various states and territories. Moreover, it is natural that in such a perfect tool of measuring scientific aptitude this high reliability co-efficient (which is a very good measure of internal consistency of the items also) normally is expected. It is an interesting feature that the students in the top group (27%) have answered questions on new areas much better than questions on traditional curricular branches. This is encouraging because it indicates wide reading on the part of brilliant students. In the bottom group (27%) the tendency is almost reverse. These students tend to answer correctly questions on traditional curricular themes in a better way than items on new information.

Again it is encouraging to find on a perusal of table (F) of the appendix (XIV) that the students both in the top and the bottom groups have answered the questions of thought type in a much better way than questions of factual type or in other words, thought type have proved to be more discriminating than the factual type because the %age rejection of items in factual type is more. It indicates that the students do possess mental capacities to attune to the new type of items where higher mental powers are called forth as against rote memory. It also indicates that the thought type questions elicit spontaneous motivation, which is vital for proper academic distinction. This is clearly brought out by consistent high achievement on these types of items. It further indicates that powers of critical thinking, analysis-synthesis and reasoning occupy an important place in the effective teaching and learning of science at the secondary stage. Items which are suitable on the basis of discriminating and difficulty values are given below.

Compulsory Part of the Test :— 1 to 7, 10, 11, 13, 14, 16 to 18, 21 to 30, 32, 34, 36 to 63, 67, 69 to 72, 75 (N_1 60)

Optional Part of the Test :—

(i) Physics :— 1, 2, 4, 5, 7, 8, 12, 14, 15, 17 to 30, 32, 35 to 39, 41 to 47, 49, 50 ($N_2$38)

(ii)	Chemistry :—	1 to 5, 8 to 11, 13, 14, 16, 18 to 21, 23 to 28, 30 to 35, 37 to 40, 42 to 46, 48 to 50, (N_3=40)
(iii)	Biology :—	1, 3 to 5, 7 to 9, 11 to 17, 19 to 29, 31 to 34, 36, 38 to 50 (N_4=43)
(iv)	Mathematics :—	1, 3, 5 to 9, 12 to 16, 19 to 22, 24 to 36, 38 to 42, 49, 50 (N_5=36)
		Thus $N=N_1+N_2+N_3+N_4+N_5=217$

An analysis of the item chart indicates that the test is a mixture of very difficult, and moderately difficult and a few easy items. Generally, in such type of test, items with high discriminating power and with a difficulty index near 50 is preferred. Only in a highly homogeneous test is a wide range of difficulty desirable that is why our cut-off point for difficulty index is 20 to 65.

One caution, however, needs continual emphasis. Item analysis data can never be the final criterion for inclusion or exclusion of test items. It is only an aid to selection. It can also give valuable hints for editing an item, so as to eliminate useless distractors, correct ambiguities, or make the item easier or harder as desired. It may also be noted that a low discrimination value does not necessarily disqualify an item, unless the test is presumed to be completely homogeneous.

6.8 RELIABILITY OF THE SCIENCE APTITUDE TEST :

The Reliability of the Science Aptitude Test has been worked out by Kuder-Richardson formula (KR-20) as stated in the Appendix XV which gives the internal consistency of the test items and thus the dependability of the test scores. For the compulsory part of the test, the figure comes out to be 0.89 and for the optional parts of the test, the figures are given below :—

(i)	Physics	$r_{11}=0.83$
(ii)	Chemistry	$r_{11}=0.86$
(iii)	Biology	$r_{11}=0.82$
(iv)	Mathematics	$r_{11}=0.72$

This method of rational equivalence stresses the intercorrelations of the items in the test and the correlation of the items with test as a whole.

6.9 INTER-CORRELATIONS OF THE SUB—TESTS OF NATIONAL SCIENCE TALENT SEARCH EXAMINATION:

From the table of inter-correlations of the various sub-tests, (Appendix XVI) it is interesting to note that all the inter-correlations between the various sub-tests of the examination are significant, except the inter-correlation between the marks secured in the Project report and in the interview. This represents

a vital change from the results obtained in the previous years, which may probably be due to better sampling technique. The technique followed, is the "stratified random sampling with proportional allocation," irrespective of the states.

A BRIEF DESCRIPTION OF THE SAMPLE :

The population, representing the marks secured by the candidates in the N.S.T.S. Examination, was classified into the various class intervals of size 10 each (i.e. 70-80 etc.) which represented our strata and from each strata a random sample of 10% of the size of each strata was drawn with the help of Tippet Random Numbers. The assumption "irrespective of states" has to be laid down because our selection tools are based on the assumption that uniform standards prevail amongst the students, coming from the various equated grades available in the states. Though the essay examination is highly saturated with verbal fluency, expression, hand writing and allied factors, (which may sometimes inhibit the process of deep thinking and concentration which are vital for answering the type of questions put in the Science Aptitude Test). Yet the obtained scores give significant inter-correlations with the three other tools of selection. We expect it to be so because in all the selection tools we are judging a common factor "scientific aptitude" of the students. This does not mean that tools are over lapping each other's domain, fully. However further factorial studies are needed to establish the relationship between the abilities called into play in responding to these four selection tools.

The insignificance of the inter-correlation between Project Report and Interview may be due to the fact that the teacher's contribution towards writing the Project Report may be so great that the examinee has very little grasp over the content matter of the Report with the result that he may have to cut a sorry figure at the interview, when he is asked questions based on his written Report. Experience has shown that this often happens at various regional interview boards.

This does not mean that this tool of selection may be abondoned because a good project report does indicate the originality of the ideas of the examinee together with his creative experimental attitude. Hence it forms a vital tool of selection for singling out potential students as distinguished from mediocres.

On the other hand the interviews do carry with them the hazard of subjectivity alongside being a vital tool for judging the depth in a particular branch of knowledge.

6.10 EMPERICAL AND PREDICTIVE VALIDITY OF THE TEST SCORES :

The validity of the test, which is "the extent to which a test measures what it purports to measure," can be measured by various means. Validity is

often measured by the correlation of the variable with a criterion (a standard by which a test or examination is to be judged for its efficiency). Regarding the content validity of the tests, it is difficult to comment on this point because there is low curricular coverage.

Regarding emperical validity, the figure has been worked out in table 6 of the Appendix (XVII) by finding the relationship between the science scores of class X or an equivalent standard with the scores obtained in the N.S.T.S. papers, on the basis of a random sample of size 246, representing the population of final awardees.

The correlational figure worked out to be 0·04 which is not significant. This may be due to the usual imperfect reliability and validity of the essay type examinations prevalent at the school stage. Secondly, N.S.T.S tests are primarily aptitude test, while the High and Higher Secondary School examinations are purely achievement tests.

On a perusal of Tables 1 to 5 of Appendix XVII representing the inter-correlations of N.S.T.S. tests with High School marks in the science subjects, it will be clear that the figures are significant except in the case of Mathematics. In the case of Physics and Biology, although the figures are significant yet these are very low. This again, may be due to one of the factors explained above. Further, it has been found that the inter-correlation between the marks secured in N.S.T.S. tests and the marks secured in General Science paper (covering the three branches of sciences i.e. General Physics, General Chemistry and General Biology at class X or equivalent level) is highly significant. Firstly, this is due to the small sample size, representing a specific group of competitors from the States of West Bengal and Madras and from a few educational institutions in Delhi territory. Secondly, the paper consists of mostly general type questions. Thus r=0.7 cannot be treated as a true measure of the emperical validity of the tests.

Tables 7 to 11 give the correlations of N.S.T.S. total with, Physics, Chemistry, Mathematics and Biology scores at the Higher Secondary examination. All the four correlations, though significant at 0.05 level, are low. These low figures can again be explained on identical lines as stated above. Regarding the predictive validity, the figure has been worked out by finding the relationship between Higher Secondary/Indian School Certificate marks with the N.S.T.S. total scores. The value r=0.22 is significant at 0.01 level. This not only serves as a reliable criterion measure but also indicates the predictive aspect of the N.S.T.S. tests. It may however be pointed out that the criterion scores are not very reliable and valid because of obvious reasons.

Table 12 of the above appendix gives a significant correlation of scores in science subjects at the high school or equivalent level with those of the Higher Secondary/Senior Cambridge level. This figure is low although both the correlated criteria are subjective and have many common factors.

In Appendix (XVII) Tables 13 to 34 represent 22 correlations between the scores obtained on the various selection tools of the N.S.T.S. Examination and the science subjects included in the curriculum of Higher Secondary classes (i.e. Mathematics, Chemistry, Physics and Biology), based on a sample of size 150 drawn from the population of candidates who appeared before the various Interview Boards with "stratified random sampling technique with proportional allocation," irrespective of the States. On the basis of this, a study of multiple correlation was performed.

The idea of multiple correlation comes into existence when we are interested in the degree of association between a dependent variable with two or more independent variables simultaneously. In other words, when we are interested to find out the combined influence of a group of variables upon specific variable (which is not included in that group), we calculate the above-stated correlation.

Tables 13 to 18 represent inter-correlations between the High School marks in Mathematics, Chemistry, Physics and Biology. It has been found that all the inter-correlations are significant at 5% level and some are highly significant, except inter-correlation between the scores in Mathematics and Biology. The above correlations give a general impression that a student scoring high in one subject is likely to do well in other subjects too. But the degree of his achievement in each subject will be different, which depends upon the respective means.

Tables 19 to 22 represent the correlations of marks scored by a specified group of students in S.A.T. (one of the selection tools of N.S.T.S. Examination) with the marks scored at class X or equivalent level in basic sciences (i.e. Physics, Chemistry, Mathematics and Biology). Most of the calculated correlations are not significant at 5% level. This may be due to different norms adopted implicitly by the different schools in the country to measure the academic achievements. Besides, the school marks measure primarily the actual achievement (with imperfect validity and reliability) whereas this objective test is intended to guage scientific aptitude (with greater reliability) rather than pure achievement. Again, the relationship between achievement and aptitude may not be exactly linear as is measured by the product moment correlation co-efficient. Moreover, in the S.A.T. an attempt has been made to include maximum number of thought type questions, which are non-curricular in nature and test the powers of reasoning, comprehension and critical thinking.

To observe upto what extent one's performance, in S.A.T. is dependent on one's performance in Physics, Chemistry, Mathematics and Biology (the variables under consideration), multiple correlation was calculated $R_{S.A.T.}$ Physics, Chemistry, Mathematics and Biology) =.346, which is significant at 5% level and indicates satisfactory emperical validity of the tool.

Thus it can be concluded that a student doing well in Physics, Chemistry, Mathematics and Biology will also do well in S.A.T inspite of the fact that there is only 24% of curricular coverage in his attempt of 125 questions. In the whole test this figure is 4%

Tables 23 to 26 represent the correlations between marks scored in the essay paper and the marks scored at class X or equivalent level in the basic sciences. It has been found that all the calculated correlations come out to be not significant. The possibility of non-significance and the negative correlation as obtained here, may be due to the fact that the essay examination is highly saturated with verbal fluency, handwriting and allied factors which may not be present in usual scholastic subjects. According to the eligibility conditions, the span of the scores in science subjects will bear a minimum cut-off point, while in essay this range is from 0 to 100%. The empirical-validity of this tool has been found to be very low which is indicated by the measure :—

R Essay (Physics, Chemistry, Mathematics, and Biology)=0.2 not significant at 0.05 level.

Tables 27 to 30 indicate the degree of association between the marks scored in various science subjects at High School level or equivalent and the Project Report. The figures calculated are very low, and are not significant. This may be due to one of the reasons explained above. The measure of empirical validity of this selection tool, given by :—

R Project Report (Phy., Chem., Math., and Biology,)=0.28 is not significant at 0.05 level.

Tables 31 to 34 gives the correlation of scores in science subjects at the High School level or equivalent with that of Interview marks (one of the selection tools of N S.T.S. Examination). The nonsignificance of the figures can be explained on identical lines as stated above.

The measure of empirical validity of this selection tool is given by :—

R Interview (Phy., Chem., Math., and Bio.)=0.24 not significant at 0.05 level.

Thus we observe from these set of multiple correlations, only $R_{S.A.T.}$ indicates satisfactory emperical validity for Science Aptitude Test.

6.11 A detailed study of the population is made in Appendix (XVIII) which gives the statewise frequency distribution of the marks scored by the candidates in the Science Aptitude Test. Measures of central tendencies have also been reported on a statewise basis. Taking into consideration the values of standard deviations and the percentage relative dispersion the position of the respective States in order of uniformity in ability of their candidates is as follows :—

Year 1964		Year 1965		Year 1966	
S.D	(%v)	S.D	(%v)	S.D	(%v)
H.P.	Pondichery	Rajasthan	Orissa	Rajasthan	Delhi
A.P.	Delhi	U.P.	M S.	M.P.	Kerala
Rajasthan	Madras	Assam	Delhi	Punjab	Orissa
Pond.	Punjab	A.P.	Pond.	A.P.	W.B.
U.P.	H.P.	Bihar	Assam	Madras	Punjab
M.P.	Mysore	Punjab	Madras	Bihar	U.T.
Gujarat	Orissa/Assam	Gujarat	Punjab	U.P.	Mysore
Bihar	Rajasthan	M.P.	Bihar	Orissa	Madras
Punjab	W.B.	Madras	A.P.	Assam	Bihar
Orissa	A.P.	Orissa	Kerala	U.T.	A.P.
Madras	Bihar	Kerala	Gujarat	Kerala	Assam
Mysore	Gujarat	Pond.	Tripura	Delhi	M.S.
W.B.	U.P.	Tripura	Rajasthan	Guj.	Rajasthan
Assam	M P.	Mysore	W.B.	W.B.	M.P.
Delhi		Delhi	M.P.	M.S.	Gujarat
M.S.		W.B.	U.P.	Mysore	U.P.

From the persual of the classification table shown above, it appears that students appearing from Delhi Territory show good performance in respect of the average score obtained by the candidates. Moreover (%v) has a tendency to decrease gradually. Thus we can predict that a certain degree of uniformity prevails amongst the student's abilities, and the educational institutions are paying sufficient attention towards this examination.

The position of Madras State, has improved in year 1966 in comparison to its position in 1965, but still lacking behind what it was in the year 1964. This is perhaps due to the fact that there is a decrease in the number of students taking the examination (which has reduced to 243 from 461 in year 1965) or the educational institutions have recommended better quality of students to take tests. But in the year 1964 this number was only 186, which seems to be highly selected sample drawn from such a big state.

Data indicates a very improved position with regard to the State of W.B. in year 1966, in comparison to its position in the last two years, taking into consideration the average marks scored and the co-efficient of variation. This may be either because the number of candidates taking the test has gone down from 500 to 394 and to 239 in the respective years or students of higher level with special coaching are recommended to take the test. The last reason seems to be partially plausible and has been verified.

There is slight improvement in the average marks scored in the State of U P. which may be due to the decrease in the number of examinees. But the the variability of students scores in ratio to their mean in the year 1966 is on the higher side as compared to the variability in the year 1964 and 1965. This is a peculiar phenomena

Similarly we can perform allied type of statistical studies in respect of various other States.

In order to have an overall picture of the type of frequency distributions of scores on S.A.T. prevailing in the various states over the three years, (1964, 65 and 66) graphs of relative frequencies are included in Appendix XVIII) :

NOTE :—

Total Marks of Science Aptitude Test

Year 1964	160 marks
Year 1965	150 ,,
Year 1966	125 ,,

6.12 Appendix (XIX) gives details of the follow-up study of some of the awardees and also gives comparative data with a parallel control group.

A random sample of thirty first divisioners was drawn from the 354 finally selected awardees and was designated as the selected group. A similar random sample of the same size was drawn from the total sample of candidates, who were not able to scure a position in the merit list of the National Science Talent Search examination because of their comparatively poor performance at all the selection tools and this has been listed under unselected group. The means of the achievement scores of the two groups in the eight different areas (mentioned below) were compared and it was found that there was significant difference in favour of selected candidates in all the areas. The natural conclusion is that the Science Aptitude Test, alongwith allied techniques, seem to be more valid tools for the selection of talented students in science as compared to the Higher Secondary and Senior Cambridge Examination results. It is proposed to have a continued follow-up programme for these two groups, so that the prognostic value of the tests may be adequately studied.

AREAS OF INVESTIGATION

(i) Science Aptitude Test

(ii) Essay

(iii) Project Report

(iv) Interview

(v) Mathematics (Higher Secondary/Senior Cambridge)

(vi) Physics (-do-)

(vii) Chemistry (-do-)

(viii) Total of science subjects (-do-)

6.13 A perusal of the Table B Appendix (XIX), showing language-wise distribution and the average marks scored by the examinees appearing from different states at the essay paper of the National Science Talent Search Examination year 1966, indicates that there is a significant tendency among the students for writing their essay paper in Hindi i.e. 42% whereas in English this percentage is 38% only. This is mainly due to the States of M.P. and U.P. recommending maximum number of examinees and to some extent the States of Bihar and Rajasthan, where the medium of instruction in Higher Secondary Schools/Intermediate Colleges is Hindi.

It is interesting to note that in case of Hindi medium States there is a tendency among the students for writing their essay paper in Hindi in comparison to the students writing paper in regional languages appearing from the states of regional language medium (i.e. W B:, Madras, Kerala, Mysore, Gujarat, Maharashtra, Assam, and A.P.). The figures are as follow :

%age of students who wrote their essay paper in	States with Hindi Medium	States with regional language medium
(i) Hindi	81%	2%
(ii) English	17%	42%
(iii) regional languages	2%	56%

Moreover, a comparative study was performed between the average scores scored by the examinees appearing from the Hindi speaking areas, areas of regional languages (the State of Mysore is excluded because of the fact that 64% of the examinees wrote their essay paper in English) and the remaining states. The figures worked out are 18.43 ; 19.77 ; and 19.44 indicating no significant difference.

Average score scored by the examinees on the essay paper based on language is given in the last row of the table, on the perusal of which we find that the average score scored by the examinee who wrote his paper in Tamil is highest i.e. 28.7. This may not be misinterpreted in terms of some special consideration to Tamil but may be due to the following reasons :—

(i) better educational facilities extended to the students in Madras State;

(ii) a good number of students recommended by the state authorities to compete for the test ;

(iii) the average score scored by the students recommended by the Madras educational authorities is highest.

6.14 A lot of research work can be undertaken on the basis of the present data, collected on a National level The resultant findings will be of far reaching importance to the teachers, educators, eductional administrators and research workers (Vide Appendix XIII).

APPENDIX I

A Report on the Summer Schools organized in June 1966 for the awardees of the National Science Talent Search Scheme

The National Science Talent Search Scheme has been introduced with the specific purpose of identifying talented students in science at the close of the higher secondary stage. One of the major objectives of this Scheme is to nurture the identified talent in the best possible way so that there may not be any stagnation and wastage of the intellectual potentialities of the students. The central idea behind the whole Scheme is to encourage the talent in such a way as to increase the out put of the individuals who have been recognized as promising ones.

Objectives :

The objectives of the Summer Schools are :—

(1) to establish inter-personal contact between the teachers and the taught;

(2) to enable the talented students to develop their intellectual potentialities in the best possible way;

(3) to motivate the experimental curiosity of the students so as to stimulate the creativity and research spirit;

(4) to enable the promising students to exchange views with their classfellows and to promote a greater understanding and appreciation of each other's views;

(5) to enable the talented students to develop new basic concepts in their fields of specialization;

(6) to encourage the scholars to pin-point their academic interests and aptitudes; and

(7) to produce an accelerated programme of science education.

Taking into consideration the above objectives, it is hoped that the students of science, who are also receipients of the science talent search scholarships will derive benefit from participation in the Summer School. Further, it is also envisaged that such summer schools will be excellent meeting ground for students from different parts of the country. This will bring about desired emotional integration, social cohesion and academic team work.

Sixteen Summer Schools of 28 days each in various subjects viz., Physics, Chemistry, Biology & Mathematics at six places of the country namely Delhi, Allahabad, Patna, Bangalore, Calcutta and Bombay were organized for the awardees of 1963, 64, 65 & 66.

Following was the programme which was adopted in each Summer School :—

(i) **Lectures**

The lectures were delivered in a particular branch of Science viz., Physics/ Chemistry/Biology/Mathematics and the topics were selected in such a way that they covered the modern aspects of knowledge in a specific branch.

(ii) **Laboratory work**

The experimental work of an investigatory type was individually-oriented and the necessary guidance was provided by the resource persons available at the Summer School

(iii) **Project Work**

Each student was expected to take up a small scientific project to be completed during the Summer School.

(iv) **Film Shows**

Some films based on scientific themes were screened.

(v) **Excursions**

Wherever considered useful and possible, excursions were arranged to places of scientific and industrial importance.

(vi) **Discussions**

The main edifices of the Summer School are the individual and group discussions. Each individual was at liberty to discuss any research academic plan with any one or more of the resource persons. The participants were also free to present papers and after each paper, discussions followed.

(vii) **Workshop Practice**

Although workshop practice was not a compulsory feature, but still in some of the summer schools this was implemented and the awardees took great interest in this training.

The following are the details about some of the Summer Schools organized in various subjects viz., Physics, Chemistry, Biology & Mathematics at six places of the country.

Summer School in Delhi

(i) Summer School in Physics

Venue :— Department of Physics & Astrophysics,
University of Delhi, Delhi-7.

Director :— Dr. S.P. Talwar,
Reader, Deptt of Physics and Astrophysics,
University of Delhi.

Duration :— 10th May, 1966 to 6th June, 1966.

Fiftynine awardees attended the school. They were given a course of about 35 lectures dealing with :—

(i) Basic Thermodynamics;
(ii) Kinetic theory;
(iii) Statistical Mechanics,
(iv) Plasma Physics;
(v) Astrophysics;
(vi) Atomic Structure;
(vii) Cosmic Rays and Elementary Particles, and
(viii) Vibrations and waves.

The emphasis in the lectures was on physical understanding rather than on mathematical rigour. The participants performed about 8 experiments in all on fundamental determinations without taking a large number of observations. The participants were divided into two groups:

1. The experimental project group:

2. The theoretical project group. In the theoretical project they were assigned a particular topic (out of topics given below) and were given various references and were also supplied with recent literature in most of the cases.

List of Projects :—

1. Theoretical Projects

1. Radiation Belts.
2. Magnetic fields in space.
3. Fuels in future.
4. Radio and optical Astronomy.
5. Quasars.
6. Sounds we do not hear.
7. Origin of the Solar System.
8. Solar wind and interplanetary Space.
9. Cosmic Evolution.

10. Transistors in modern Industry.
11. Elementary Particles.
12 Radio activity—a boon or a hazard

Topics (1) to (9) except (6) were supervised by Dr S.P. Talwar; topics (6) & (10) by Shri S.K Nandi, and topics (11) & (12) by Dr. M.K. Machwe respectively.

2 **Experimental Projects**

1 Neon-Lamp flip-flap circuit.
2. Coincidence circuit.
3. D.C to A.C. Converter
4. Transistorised oscillator.
5. Binary unit

Three special lectures were arranged by the following :—

1	Dr. A.R. Verma	"Monomolecular thin films"
2.	Dr K.S. Singwi	"Studies of liquid state"
3.	Dr M.S. Sodha	"M.H.D. Power Generation"

The awardees got a chance of visiting the places of scientific interest like N.P.L. and Meteorological Observatory.

(ii) Summer School in Chemistry.

Venue :— Department of Chemistry,
University of Delhi, Delhi-7.

Director :— Prof. R.P. Mitra,
Head of the Department of Chemistry,
University of Delhi, Delhi-7.

Duration :— 10th May, 1966, to 6th June, 1966.

Twenty six students in all participated in the School, seventeen of whom were girl students. The following lectures were delivered by the resource persons.

Name of the Speaker	Name of Topic
Dr. S.K. Mukerjee	(i) Generalised acid-base concept in organic chemistry.
	(ii) Causes of acidity of organic molecules.
	(iii) Optical activity of molecules & Stereochemistry.
Dr. Atreyi	Chemistry of macromolecules."

Dr. M.V.R. Rao	(i) Collisions between molecules. (ii) Evaluation of Collision number. (iii) Calculation of specific reaction rate (iv) Collisions between energy rich molecules. (v) Potential energy curves (vi) Transition state complex.
Dr. A.N. Bhat	(i) Oxidation-reduction reactions. (ii) Fertilizer Industry in our country. (iii) Acid-base concept, nature of co-ordinate covalent bond and isomerism in coordination compound.

In addition to the above, the students were familiarized with new techniques in both qualitative and quantitative inorganic analysis in their practical work They carried out the quantitative analysis on a Semi-micro scale using appropriate gadgets. Identification of simple cations and anions using the technique of gelchromatography was also introduced. Spectrophotometric estimation of metal ions when present in traces as well as electroanalysis of copper using an electrolyser were also undertaken They also conducted some practical work encompassing modern techniques of micro-chemistry like paper chromatography, thin layer chromatography, micro preparations and crystallisations. One synthesis on semimicro level using quick fit apparatus and extraction of a natural product was also included in the course. They also prepared one of the Warners co-ordination compounds. The students were shown all the modern research tools like micro-balances, ultraviolet & infrared spectro-photometers and their uses were explained with appropriate data.

Some group discussions and seminars were held on the following topics under the guidance of Dr. A.N. Bhat :

1. Solubility product concept and its application in qualitative and quantitative inorganic analysis.
2. Nature of precipitates.
3. Ionic and covalent bonding.
4 Nature of co-ordinate covalent bond

Scientific film-shows were arranged once a week through the courtesy of U. S. I. S.

Students were taken to the Shri Ram Institute of Industrial Research.

A social function was arranged on 4th June, 1966. Dr. C.D. Deshmukh, Vice-Chancellor graced the occasion and addressed the students.

(iii) Summer School in Biology.

Venue :— Hans Raj College
Delhi University Enclave,
Delhi-7.

Director :— Dr. S. L. Tandon
Reader, Deptt. of Botany,
University of Delhi, Delhi-7.

Duration :— 10th May to 6th June, 1966.

25 participants, including 16 girls & 9 boys attended the school. The women participants were lodged in Miranda House Hostel while the boys were put in the Hostel at Sri Ram College of Commerce. The daily programme included a lecture of 50 minutes duration followed by discussion for about 15 minutes. Two-hour practical work was the last item in the daily schedule of work Saturdays were allotted exclusively for educational excursions.

In all 18 lectures were delivered (mostly on biological subjects) on following topics :—

1. The origin of Life.
2. Viruses.
3. Vertebrate evolution.
4. Reproduction in Animals—I (A sexual reproduction).
5. Reproduction in Animals—II (Sexual reproduction).
6. Plant Hormones.
7. Animal Hormones.
8. Human Genetics—I (Autosomal Inheritance).
9. Photosynthesis—Present status.
10. Human Genetics—II (Sex-Linked Inheritance)
11. Genetic Code.
12. Social Life in Animals—I (Invertebrates & Vertebrates).
13. Osmoregulations.
14 Human GeneticsIII—(Heredity & environment).
15. Social life in Animals—II (Insects).
16. Germ theory of disease.
17. Animal parasites.
18. Role of algae in sewage disposal.

Shri V. P. Oberoi, Dr. R.D. Gulati, Shri V.P. Singh, Dr. H.S. Vishnoi were the resource persons who were invited to deliver the lectures respectively. Besides this, students performed 16 practicals in Botany & Zoology.

List of Practicals in Botany

(i) Extraction of chlorophyll pigments and their separation by chemical method.
(ii) Separation of chlorophyll pigments by paper chromatography.
(iii) Determination of osmotic pressure of cell sap.
(iv) Microchemical tests for fats, proteins, cellulose, starch, lignocellulose etc.
(v) Effect of temperature on enzyme activity.
(vi) Study of various economic plants & techniques of tissue culture.
(vii) Properties of colloids and cytoplasmic movements.
(viii) Temporary squashes of the root tips of onion.

List of Practicals in Zoology

1. Demonstration of pulsation of heart and capillary circulation in some representative animals.
2. Effect of temperature and chemicals on the rate of heart beat in frog.
3. Estimation of oxygen and chloride contents of samples of fresh water.
4. Discussion of various aspects of water pollution in reference to the water analysis.
5. Incubation of hen's eggs and demonstration of living embryonic stages.
6. Examination of intestinal contents of frog, cockroach and termites for the study of the parasitic animals found therein.
7. Examination of pond water for the study of animal life present therein.
8. Exercise on animal classification and drawing up of the identification keys.

A discussion was arranged after each practical exercise.

The participants were divided into two groups for seminars. The topics chosen for seminars are as follows :

1. Plants and Human Welfare.
2. Animals and Human Welfare.
3. Biological Control.
4. Economic Importance of Micro-organisms.
5. Antibiotics
6. Animal Diversity.
7. Discovery and Importance of Vitamins.
8. Adaptations.

Three film shows were arranged through the courtesy of USIS, New Delhi, in which a total of twelve scientific and three documentary films were exhibited.

May 20, 1966

1. What is disease?
2. Sniffles and Sneezes.
3. Wild life and Human touch.
4. Gift of Green.
5. Film Journal No. 9.

May 27, 1966

1. Your body during adolescence.
2. Hook worm
3. Clean waters.
4. Web of life The strand grows.
   Flight of Gemini IV.

June 3, 1966

1. Handful of soil.
2. Insects as carriers of diseases.
3. Man and Radiation.
4. High over the border.
5. Gemini 7/6 Rendezvous.

Special library facilities were given to the students so as to enable them to carry out with their experiments.

During their stay the following excursions programme were made.

1. Visit to Delhi Zoological Gardens for the study of Indian and exotic animals.

2. Visits to Indian Agricultural Research Institute for seeing the Divisions of Botony and Entomology, the Gamma Garden, and to the Delhi Milk Scheme for gaining a practical experience in the process of pasteurization.

3. Visit to Okhla and Mehrauli area for studying the aquatic and scrub vegetation. A visit to the National Museum and Nehru Museum (Teen Murti).

(2) Summer School in Allahabad

(i) Summer School in Mathematics.

Venue :— Allahabad University
Allahabad.

Director :— Prof. R. S. Mishra
Head of the Department of Mathematics
Allahabad University, Allahabad.

Duration :— 10th May, to 6th June, 1966.

Nineteen awardees participated in the School. Following are the resource persons who delivered the following lectures :—

Names of the Speakers	Topics
Shri H.C. Khare	"Elements of Group Theory" "Matrix Algebra & Vector".
Shri R. S. Gupta	"Set Theory".
Dr. H P. Dikshit	"Theory of Subgroups" "Normal & Factor groups", "Rings, Ideals, Integral domains, Skew-fields & fields, Homomorphism of groups and rings".
Dr. (Mrs.) Snehlata Nigam	"Natural Numbers". "Peono's Axioms". "Euclidean Algorithm and fundamental theorem of Arithmetic". "Rational Numbers". "Real numbers & their properties". "Complex numbers & their properties". "Integers".

Besides this, some group discussions were devoted to a variety of topics according to the course prescribed for the institute. Topics covered are mostly the subject matters taught in the class. The broad head lines are mentioned below:

"Number system".
"Groups, Rings, Fields, Matrices & Determinants".
"Sets, relations and functions",
"Theory of Groups".
"Rings, Integral Domains, Fields."

The students were challenged to solve intricate questions and were helped, if necessary, in reaching the correct solutions.

(ii) Summer School in Physics

Venue .— Allahabad University
Allahabad

Director :— Prof. Vachaspati
Head of Physics Deptt.
Allahabad University, Allahabad.

Duration :— 10th May to 6th June, 1966

The inaugural address was delivered by Prof. Vachaspati, the Director of the Summer School in which he spoke about the modern advancement of science in the world, which is due mainly to team work. The respective resource persons invited were Dr. G.S. Verma, Dr Krishna Gopal, Dr. Arvind Mohan, & Dr. B.K. Srivastava. 34 awardees attended the school.

Resource Persons	Topics
Dr. Arvind Mohan	"Quantum Physics". "Relativity". "Wave Mechanics". "Nuclear Physics". "Ultrasonics". "Inspection and Communication systems."
Dr. K.G. Srivastva	"*Electronics*" (i) Solid state device. (ii) Principles of transmitter & receiver. (iii) Electronic Instruments.

Discussion on the scientific topics were made under the guidance of their group teachers. More emphasis was laid on the Laboratory work. Students had to spend daily three hours in the Laboratory. Each student was given time to speak on topics on which he had written essays during library consultation period. Besides all this about 50 films on scientific topics were screened.

Programme for Competitions

(i) Essay writing on a given topic.
(ii) General knowledge competition.
(iii) Assessment Test.
(iv) Games Final.

The toppers were awarded suitable prizes.

Programme of Excursions

(i) Visit to Industrial Colony, Naini.
(ii) Picnic by boat to Sangam & dinner on boat.

(3) Summer School at Bangalore.

(i) Summer School in Physics.

Venue :— The National College
Bangalore-4.

Director :— Dr. N Narasimhaiah
Prof. of Physics and Principal,
National College, Bangalore.

Duration :— 10th May to 6th June 1966

The inaugural address was delivered by Dr. C.V. Raman at a common inaugural function jointly organised by the Directors of the Summer Schools in Physics, Chemistry, & Biology at Bangalore in the evening of May 10, 1966. The meeting was presided over by Sri T.R. Jayaraman, the then Vice-Chancellor of the Bangalore University. It was largely attended by the public in addition to the participating students who were thrilled by the inspiring address of Dr. C.V. Raman, 27 awardees, including 7 girls, attended the school.

The programme of the Summer School consisted of 35 lectures in different areas of science followed by discussions, 12 invitation lectures, 2 supplementary demonstration lectures and Laboratory work and workshop practice. The special library facilities were given to the students so as to enable them to work successfully on their projects which were alloted to them.

Students were taken on a guided tour of the various places of scientific interest like:

(i) National Aeronautical Laboratory.
(ii) C.F.T.R.I.
(iii) Visweswarriah Institute of Technological Museum.
(iv) Indian Telephone Industries.
(v) India Institute of mental Health.
(vi) Hindustan Machine Tools Ltd.

Invitation Lecturers

(i) Prof. R.L. Narasimhaiah	"Radio Astronomy"
(ii) Prof H.S. Venkataramaiah	"Low Temperature Physics"

Supplementary demonstration lectures.

Dr. R. Srinivasan	"Crystals & their colours"
Prof. P.S. Narayana	"Crystal optics"

Workshop Practice

Workshop practice was arranged on two days, 3 hours each day. Preliminary ideas on carpentry and filling were imparted.

Project Work

The Laboratory was kept open till 11.00 P.M. Each participant took a a Project work and their reports were graded, accordingly. Topics are :—

(i) Radio Receiver.
(ii) Crystal Structure.
(iii) Lissajous Figures.
(iv) Damping of Simple pendulum.
(v) Geiger Muller Counter.
(vi) Thermoelectric Effect.
(vii) "g" by various methods.
(viii) G.M. Counter.
(ix) Viscosity of solutions.
(x) Surface tension of water with impurities.
(xi) Stroboscope.
(xii) "g" by Metronome.

List of topics covered in experiments conducted at the National College :

(i) Triode Valve.
(ii) Interference of sound waves.
(iii) Ripple Tank.
(iv) Experiment with C.R.O. like obtaining the Lissajous figures.
(v) To determine the wavelength of the given achromatic source.
(vi) To determine the wavelengths of the red and blue lines of the Hydrogen Spectrum.
(vii) To obtain contact prints using the developer solution.
(viii) Growth of $CuSO_4$, $5H_2O$ crystals.
(ix) Mesurement of interfacial angles by contact and optical goniometers.
(x) Study of X-ray diffraction (LAUE pattern).
(xi) Measurement of the half-life of Th. B.
(xii) Measurement by a single-channel analyser Scintillation spectrometer, of the β—spectrum of Zn^{65}.

The students were introduced with numerous examples and models to the ideas of lattices, unit cells and symmetries of crystals. This paved the way for simple calculations of the physical properties (e.g. elasticity) of solids on

the basis of Inter-atomic forces as well as to the ideas of anisotropy of crystals. Methods of determining the atomic structure of solids by X-rays and neutrons were also considered. Defects in crystals and their important practical rules were then discussed. A demonstration lecture illustrating the general phenomenon of radioactivity in relation to nuclear structure and radio activity methods of geochronology and cosmochronology were delivered, with a brief account of two recent-topics of interest (i) Mossbauer effect and (ii) Neutrino Physics & Astronomy in this field.

In all the following fifteen films based on scientific topics were screened :

Crystals, Sound Waves in Air, Rutherford Atom, Malfer Waves, Forces, Millikan's Experiments, Deflecting forces, Universal Gravitation, Photons, Mass of Electron, Photo-electric effect, Vectors, Fundamentals of Acoustics, Mechanical Energy, High Energy Particle Accelerators.

The students of the Physics School joined the students of the Summer Schools of Chemistry and Biology in an excursion to the Nandi Hills.

(*ii*) **Summer School in Chemistry**

Venue :— St. Joseph's College Bangalore.

Director — Dr. K. Srinivasan
Head of the Department of Chemistry.
St. Joseph's College

Duration :— 10th May to 6th June, 1966.

Seventeen students attended the programme, including six girls. Boys and girls were lodged in separate buildings near the venue.

Resource Persons

The following members constituted the resource persons of the school.

1. Dr. K. Srinivasan — Director
2. Dr. M.V. Bhat
   Associate Professor
   Deptt. of Organic Chemistry
   Indian Institute of Science
   Bangalore.
3. Dr. K.S. Narayan
   Deptt. of Inorganic & Physical
   Chemistry, Indian Institute of
   Science Bangalore, Bangalore.
4. Shri H.P. Rangaraj
   Deptt. of chemistry
   St. Joseph's college
   Bangalore.

5. Shri B.D Ananethanathan
Deptt. of Chemistry
St. Joesph's College Bangalore.

The participating students were given a Quiz to enable the resource persons to know the academic level of the students.

The daily programme of work was as follows :—

Morning Session	...	9 A.M. to 12 Noon	2 lectures each of one hour duration followed by discussion.
Afternoon Session	..	2 P.M. to 5 P.M.	Laboratory work and film show.

At the very outset, issues of the Journal of Chemical Education were made available to the students and each of them was asked to make a selection of one Project according to his/her aptitude out of the given list of Projects. Besides this to assess their team work, students were divided into two groups and each group was given a separate project.

Special Lectures :—

Dr R.S. Subrahmanya Asst. Professor, Indian Institute of Science	"Polarography".
Dr. A K N. Reddy Asst. Professor Indian Institute of Science	"Recent work in the field of passivity".

In addition, the students were taken to the Indian Institute of Science. They visited the Departments of Inorganic & Physical Chemistry, Organic Chemistry and Bio-Chemistry and familiarised themselves with the work that is being carried out in the Departments. 16 films, used in the Chemistry study programme, were shown to the Science Talent Scholars.

The valedictory function was presided over by Dr. Salhdana S.J., Vice-Principal of St. Joseph's College.

(iii) Summer School in Biology

Venue :— Engineering College,
Bangalore.

Director :— Dr. M. Nagraj
Head of the Deptt. of Botany
Central College, Bangalore.

Duration :— 10th May to 6th June, 1966.

Ten students attended the school.

Resource Persons	Topics
Dr. M. Nagaraj	"Cell Biology".
Shri A. Sheriff	"Cytological, genetical & evolutionary aspects of Biology". "Origin and evolution of life". "Theoretical & practical aspects on Microbiology & Palaeobotany.
Shri T. Thathachar	Topics selected were (i) Viruses: nature, importance as pathogens of plants and animals. (ii) Bacteria. (iii) Antibiotics. (iv) Fungi & Human Welfare. (v) Fossils.
Zoology Sh. P. Rama Krishna Iyer and Sh. M.D. Parthasarthy	Evolutionary trends in Invertebrate and vertebrate groups in the light of morphology functional anatomy etc; the organisation of animal societies and its impact on behavioral tendencies; brief insight into neuromuscular; excretory, sensory and applied Physiology; osmoregulatory mechanism in relation to environmental stress ; internal environment of animals and chemical co-ordination ; and review of reproductive patterns and pituitary Gonadal relations.

Demonstrations-cum-practicals were held in fish spawning with pituitary hormone extracts. Extraction of micro-fauna with the help of Berlese funnel was shown.

Practicals

1. Living plant cell. Elodea & Tradescantia.
2. Epidermis and epidermal outgrowth.
3. Mitosis in onion root tip.
4. Meiosis.

5. Photosynthesis.
6. Respiration
7. Etiolation and normal growth.
8. Tissue systems.
9. Osmosis and Plasmolysis.
10. Fossils-macrofossils, impressions and sections.
11. Bacteria, yeasts and moulds.
12. Micro-chemical tests.
13. Study of living Protozoa and Parasitic Protozoa.
14. Dissection of earthworm.
15. Dissection of frog.
16. Blood circulation.
17. Some simple staining methods, Intra vitam staining.
18. Examination of Blood Smears.
19. Microtomy work.

Besides this, some films based on scientific topics wese screened.

The students were taken to the Indian Institute of Science, Bangalore to acquaint them with allied branches such as Pharmocology, Bio-Chemistry and also the Electron-microscope. Two Local trips were arranged to Lal-bagh (Botanical Gardens); one trip to Bannerghatta (Forest reserve about 10 miles from Bangalore), and an excursion to Bandipur (wild life sanctuary, Mysore State) and Ootacamund and Coonoor Botanical gardens to acquaint them with the national flora and fauna.

(4) Summer School in Calcutta

(i) Summer School in Physics.

Venue :— Saha Institute of Nuclear Physics,
92-Acharya Prafulla Chandra Road,
Calcutta-9.

Director :— Prof. B.D. Nag Chaudhuri
Saha Institute of Nuclear Physics,
92-Acharya Prafulla Chandra Road,
Calcutta-9.

Duration :— 10th May to 6th June 1966.

Twenty two awardees attended the School.

Resource Persons	Topics
Prof. B.D. Nag Chaudhuri.	"Physics in application".

Shri S. B. Kar	(i) Newtonian Mechanics. Motion Momentum Rotation
	(ii) Quantum Mechanics, Particles, waves, Probability uncertainty, Atom.
	(iii) Atomic Physics, Electron levels, spectra, X-rays, periodic table.
Shri S. Chatterjee	(i) "General properties of Nuclei". Natural radio activity, detectors, artificial radioactivity, accelerators, isotopes, liquid drop model, fission and fusion, Nuclear power.
	(ii) History of the growth of Physics.
Dr. M.K. Das Gupta	New frontiers in Radio Astronomy.

All the students spent 4 afternoons in the workshop. They were introduced with the principles and functions of (i) lathe (ii) milling machine (iii) drill etc. They were allowed to handle some of the machines.

A set of experiments were arranged. Groups of two or three students were entrusted to set up such experiments. After the experiments were set other groups also worked with them. The major experiments were :—

(i) To measure the value of e/m
(ii) To set up a vacuum unit including oil diffusion pump and measure the vacuum with various types of vacuum gauges.
(iii) To set up an optical bench with a photocell as light detector ; to verify the inverse square law and to measure the spectral response of the photocell.
(iv) To prepare a search coil and map the magnetic field of an electromagnet.
(v) To set up a Geiger counter, to measure the plateau and to find the half life of the given radioactive source.
(vi) Construction of a radio receiver.
(vii) To measure the value of "g" with the help of a simple pendulum and also by measuring the time of free fall with an oscilloscope.
(viii) Calculations with desk computer.

Following projects were allotted to the students :

(i) Production & measurement of High Vacua.
(ii) Radio Receiver :— Construction of a simple valve set.
(iii) Electron microscope.
Students in groups spent one afternoon at the electron microscope laboratory learning about the actual operation of the instrument.

Visits

The students visited (i) the Planetarium (ii) the Birla Industrial and Technological Museum and (iii) the various laboratories of the Saha Institute of Nuclear Physics and were shown some scientific instruments like Cockraf-Walton Generator, Cyclotron, Magnetic resonance spectrometers, mass spectrometer and mas separator

(5) Summer school in Patna

(i) Summer school in chemistry.

Venue :—	Science College, Patna.
Director :—	Prof. J.N. Chatterjee, Head of the Deptt. of Chemistry, Patna University.
Duration :—	10th May to 6th June, 1966.

17 awardees attended the school. In all 43 lectures were delivered with two special Lectures.

List of Resource Persons :

(i) Dr. A.B. Lal
(ii) Dr. S.N. Das
(iii) Dr. A.K. Banerjee
(iv) Dr. J.C. Chugh.

Following topics were covered by resource persons in the theory classes :—

"Organic Chemistry."
"Homogenous Equilibrium."
"Elements of Kinetic theory."
"An Introduction to Thermochemistry."
"Thermodynamic."
"Equivalent weight."
"Some numerical problems."
"Physical Concepts and structure of molecules."
"Electronic Interpretation of Organic Reactions."
"Inorganic Chemistry."

(Atom, Bohr theory, Chemical Bond, Nitrogen molecule, concept of Hybridisation, Ionic Bonding and stabilisation of Ions in crystals, Potential and Partial covalency, conductors).

Special Lectures

(i) Dr. B. Prasad, ex-vice-chancellor of Patna University gave a special lecture on "New Methods of solving volumetric problems."

(ii) Prof. B.K. Ghosh spoke on "Artificial Rain making" with adequate illustrations with films and slides.

Students performed experiments on the topic which they covered in their theory classes and special Laboratory facilities were provided to the students.

Excrusions

The participants were taken round the places at Patna, Nalanda and Rajgir.

Films

Through the courtesy of Prof. Satya Prakash of Allahabad University, 24 coloured American films of chemical interest were exhibited. U.S.I.S. Patna also provided some films on general science.

(ii) **Summer School in Biology**

Venue :—	Deptt. of Botany, Patna University, Patna-5.
Director :—	Prof. R.P. Roy, Head of the Deptt. of Botany, Patna University.
Duration :—	10th May to 6th June 1966.

6 students attended the school. The inaugural lecture was delivered by Prof. Roy, on "Introduction to Cytological Techniques."

Resource Persons	Topics
Prof. R.P. Roy, Professor and Head of the Deptt. of Botany, Patna University, Patna.	"Modern Genetics" and "Genetic Code"

Laboratories :	"cytological techniques"
Dr. R. P. Sinha Lecturer in Botany, Patna University, (Field of Specialization: Experimental Taxonomy).	"Species concept and speciation." "Methods in Experimental Taxonomy" "Nomenclature, Synonymy, Diagnosis and Typification."
Laboratories :	Methods of keying taxa. Examples, Illustrations and Uses of some of the important methods in Experimental Taxonomy.
Dr. V. Thakur Lecturer in Botany Patna University (Field of specialization: Population Genetics and Evaluation).	"Organizational patterns and Diversity of plant life". "Evolution and Isolating mechanisms. "Origin of cultivated plants".
Laboratories :—	Examination of plants of various forms. Studies of reproductive systems in plants. Hybrid cytology.
Dr. Devendra Prasad Reader and Head of the Deptt. of Zoology' Science college Patna. (Field of specialization: Parasitology).	"Parasitism." "Parasites of man" "Control of parasites and parasitic diseases."
Laboratories	"Obtaining parasites by dissection of some common animals." "Studies of the effects of environment, temperature and taxes on parasites." "Examination of faecal samples for helminth eggs."
Dr. S.N. Ahsan Lecturer in Zoology Patna University.	Energy production in cells. Cell membrane and transport of substances in cells.

Laboratories :	Study of permeability of R B.C. membrane of man and other animals. Penetration of carbon compounds in algal cells.
Sh. M.M. Varma Lecturer in Zoology Patna University	Cell structure and cell Physiology. The mitochondrion and Energy fixation. Evolution of man.
Laboratories :	Phase contrast microscopy. Demonstration of Golgi apparatus in fixed tissues. Use of Paper chromatography in determining amino acids.

Following are the topics covered in the project work taken by the students:

1. Evolution of the energy producing systems.
2. A comparative study of recombination indices as a measure of variability in inbreeding and outbreeding plant species.
3. Separation and identification of free amino acids in tissues by the paper chromatography techniques.
4. Effects of Testosterone propionate on prostate gland of Guinea pig (cavia procellus)

The students were provided with all facilities of consulting books, Journals and other reference books during the tenure of the school. The departmental library of the Botany Deptt. was open to them and they were allowed to get books of their choice issued temporarily for studies at their hostel.

Students had an opportunity for field work mainly based on the studies of flora and fauna. They were taken to all the important places in and around Patna; namely: Govt. House, Golghar, Patna Agricultural Research Station and Patna museum.

(6) Summer School at Bombay

(i) **Summer School in Physics**

Venue :—Ram Narayan Ruia College, Matunga, Bombay.

Director :—Prof. V. G. Bhide
Head of the Physics Deptt.
Institute of Science, Bombay.

Duration :—10th May to 6th June, 1966.

Twenty two students who had passed either the first year or the second year of B. Sc. course or equivalent attended the school. The accommodation for 5 girl students was made separately in the Principal's quarter.

Resource Persons

i) Prof. V. G. Bhide — Director
ii) Prin. R. D. Godbole
iii) Prof. R. V. Barve
iv) Prof. R. D. Gupta
v) Prof. V. M. Palekar
vi) Dr. M. B. Karnik

Lecture work : Topics covered Solid State Physics, Statistical mechanics, relativity, wave-mechanics, wave-motion, nuclear physics.

Laboratory work : (a) Some fundamental experiments like

(i) determination of G
(ii) e by Millikan's method
(iii) e/m
(iv) velocity of light

(b) Wave phenomena : Ripple tank expts.

(c) Optical Expts. · Zone plate, Michelsons' interferometer, spectrometer.

(d) Electrical and Electronic Expts. ; C.R.O., series and resonance and parallel circuits, temperature coefficient of resistance of a semi conductor and conductor, Lechre wires.

(e) Crystal growth from solution, observation and description, crystal model, measurement of angles etc.

(f) Radioactivity demonstrations, half-value period of Thoron, introduction to use of a scaler and a Gamma-ray spectrometer

Students were taken to the Institute of Science for observation of Solid state expts., crystals and X-ray experiments.

Film shows :

(1) Measurement
(2) Forces
(3) Frames of reference
(4) Ripple tank and wave phenomena.

There was a special lecture delivered by Prof. S.P. Pandya on "Field emission" Special Library facilities were given to the students, so as to enable them to work on their Projects.

A visit to Tata Institute of Fundamental Research was arranged on 3rd June, 1967 at the conclusion of which students and teachers had a get together at the R.R. college.

(ii) **Summer School in Mathematics.**

Venue .—	Department of Mathematics, University of Bombay.
Director :—	Prof. S.S. Shrikhande, Head of the Mathematics Deptt. Bombay University.
Duration .—	10th May to 6 June, 1966.

Eight students who had passed either the first year or the second year of B.Sc. course or equivalent attended the School. Following are the few detail about the Summer School.

Resource Persons

(i) Prof. S.S. Shrikhade : Director.
(ii) Miss V.N. Bhatt
(iii) Mrs. S.P. Khandeparkar
(iv) Shri B.D. Khanwalkar
(v) Dr. U. Shukla

Lecture Work

A course of 43 lectures of forty-five minutes each was given on the "Number system." The cyclostyled copies of the lecture notes were supplied to the participants. The contents of the course were as follows :—

Chapter (i) Theory of Sets.
Chapter (ii) Abstract Algebra.
Chapter (iii) Natural numbers, Integers and Rational Numbers.
Chapter (iv) Real Numbers
Chapter (v) Topology of the Real Line.
Chapter (vi) Complex Numbers.

Besides this, students took great interest in the individual and group discussions. Each individual was at liberty to discuss any research academic plan with any one or more of the resource persons. Special library facilities were given to the students. Due to less number of the participants, there was great personal touch between the resource persons and the participants.

Participants were taken around the places of scientific interest.

It appears from their reports that the course infused great interest, and the participants felt that they had learnt something which they had not learnt before, and that the course had opened to them possibilities of further study on their own.

APPENDIX II

SAMPLE ITEMS FROM SCIENCE APTITUDE TEST, 1966

PART—A—COMPULSORY

THOUGHT TYPE QUESTIONS

PHYSICS

Section 1

Natural uranium represents a mixture of two isotopes U^{238} and $U,^{235}$ that are present in the relative amounts of 99 3 and 0.7 per cent respectively. The study of these two isotopes under the influence of neutron bombardment had shown that the rarer isotope is much more fissionable than the more abundant one. Indeed, whereas U^{238} nuclei will not break up unless bombarding neutrons have an energy exceeding 1.2 Me V, U^{235} nuclei can be broken up by neutrons moving with much smaller velocities. Infact the breaking up probability increases with decreasing velocity of incident neutrons.

In the range between high energies needed to fission U^{238} and the very tlow energies favourable for fissioning U^{235}, neutrons are absorbed by U^{238} without causing the latter to fission.

QUESTIONS ON SECTION 1

1. Fission process means

   1. absorption of a neutron by a nucleus ☐
   2. break up of a nucleus ☐
   3. neutron bombardment ☐
   4. scattering of neutrons ☐

2. Me V is a unit of

   1. power ☐
   2. velocity ☐
   3. energy ☐
   4. number of neutrons ☐

3. Neutrons of what energy will fission U^{235} more readily ?

   1. 0.0012 Me V ☐
   2. 0 12 Me V ☐
   3. 1.2 Me V ☐
   4. 12 Me V ☐

4. Neutrons of what energy will fission U^{238} more readily ?

1. 0.0012 Me V [ ]
2. 0.12 Me V [ ]
3. 1.2 Me V [ ]
4. 12 Me V [ ]

MATHEMATICS

Section 2

Addition and multiplication are binary operations on real numbers, *i.e.*, when we combine two real numbers by these operations, we get new real numbers. We can have other similar binary operations. A general binary operation will be denoted by '0'.

Thus if aob stands for a+2b, to perform this operation on two real numbers, we double the second real number and add it to the first, so that

$203=2+2(3)=8$, $405=4+2(5)=14$

Similarly if aob stands for a^b then $204=2^4=16$

An operation is called commutative if (aob)=(boa) for all a, & b,

An operation is called associative If ao (boc)=(aob) oc for all a,b,c.

QUESTIONS ON SECTION 2

5. If $aob=a^2+b^2$, then

1. 304 = 7 [ ]
2. 304 = 12 [ ]
3. 304 = 25 [ ]
4. 304 = 34 [ ]

6. If $aob=a^b$, then

1. 20 (203) = 12 [ ]
2. 20 (203) = 64 [ ]
3. 20 (203) = 128 [ ]
4. 20 (203) = 256 [ ]

AGRICULTURE

Section 3

Soil erosion is the process of destruction of the soil and the transport of the products of destruction by water and wind. The activity of running water causes sheet and linear erosion. The blowing away or dispersion of friable soil by winds is referred to as deflection or wind erosion As a natural phenomenon, erosion by water occurs where surface runoff is pronounced. Erosion is inevitably followed by the accumulation of the products of destruction of the soil. The intensity of erosion is closely dependent upon the natural conditions. Of great importance are the climate, the characteristics of the soil and soil

forming rocks, the incline, the nature of vegetation and the agricultural methods used Under natural conditions a cover of vegetation limits the extent of soil erosion; removal of the cover may bring about great loss of soil wealth.

QUESTIONS ON SECTION 3

7. Erosion results in

   1 soil formation [ ]
   2. soil displacement [ ]
   3. soil renovation [ ]
   4. soil exhaustion [ ]

8. Plantations

   1. check erosion [ ]
   2. help erosion [ ]
   3. do not affect erosion [ ]
   4. result in loss of soil wealth [ ]

ENGINEERING

Section 4

Power requirement in India is growing fast, which is met by rapid electrification. Steam under pressure is produced by the heat of burning coal or oil in a boiler. The steam is used to drive engines and turbines. In power houses the turbines drive electric generators to produce electricity.

Hydroelectric stations produce electric power by utilising the energy of rain water stored by dams to drive water turbines connected to electric generators. The water coming out of the power station is used for irrigation.

Nuclear reactions release a lot of heat energy for a very small amount of fuel. This energy can be converted to electrical energy but the process is at present expensive and complicated. The machinery too has to be imported.

Good coal is required for the production of iron and steel by reducing iron ore. In India good metallurgical coal is not available in plenty. Mineral oil is the most suitable fuel for internal combustion engines, but most of it has to be imported. As there are many high mountains with plenty of rain, the possibility of developing hydroelectric power stations is great. India also has a large supply of thorium from which nuclear fuel can be produced; work in this direction has only recently started.

QUESTIONS ON SECTION 4

9. Potential energy is converted into electrical energy in a
   1. steam station burning coal [ ]
   2. diesel station using diesel oil [ ]

3. hydroelectric power station ☐
4. nuclear power station ☐

10. Present day high speed aeroplanes use energy from

1. coal ☐
2. mineral oil ☐
3. hydroelectric power ☐
4. nuclear reactions ☐

11. To save precious metallurgical coal and foreign exchange, the highest priority should at present be given to the development of

1. steam power stations ☐
2. diesel power stations ☐
3. hydroelectric power stations ☐
4. nuclear power stations ☐

BIO-CHEMISTRY

Section 5

The energy sources in human foods are commonly fats and sugars. These two items are ordinarily devoid of nitrogenous constituents, while the essential nitrogenous materials in foods are proteins which are primarily responsible in health for the build-up of the body during the phase of growth in children and for the maintenance of its wear and tear in the adult.

In the body, the food items like fats and sugars (or carbohydrates) have double roles to play. On one hand they are part of the body frame and its make-up, on the other, they are the ready source of energy for the body through the process of chemical breakdown. In this process of breakdown the longer chains of carbon surrounded by hydrogen (and/or oxygen) are broken-down to smaller and smaller units.

In the course of this stepwise break-up of fats and carbohydrates, the waste products produced are carbon dioxide and water. The essential process is to dismember the metabolic units through the stepwise removal of hydrogen in the form of water and the break-up of molecules is termed as oxidation.

The removal of carbon is by oxidative decarboxylation. The break-up of the molecules happens in steps and the release of heat or energy is also in smaller packets, instead of in one explosive generation. The release of energy is brought about by the catalytic influence of the enzymes. Each cell in the body breaks-up such metabolic units of fats and sugars ultimately to carbon-dioxide and water and the function of the blood is to bring in oxygen from atmosphere to neutralise hydrogen produced in oxidation of smaller units and to wash carbon dioxide from the cell out into the atmosphere.

QUESTIONS ON SECTION 5

12. Cells in the body break-up sugar and fat into

1. enzymes ☐
2. nitrogenous products ☐
3. carbon dioxide and water ☐
4. atmospheric oxygen ☐

13. Energy production in the body is brought about through

1. stepwise break-up of sugar and fat through the help of enzymes ☐
2. release of secretions from endocrine glands ☐
3. over production of carbon dioxide ☐
4. transport of oxygen and carbon dioxide to and from atmospheric air by blood ☐

CHEMISTRY

Section 6

Though arsenic element is not poisonous, arsenic trioxide is extremely poisonous substance. Arsenic is one of the most easily detected poisons. Arsenic and many of its compounds produce a garlic-like odour when heated stongly. Arsenic trioxide sublimes at a temperature of 193°C.

A murder mystery centered around a crime committed at a 'marshmallow and wiener roast' in the following manner :

The murderer sprinkled white arsenic on a marshmallow just before the victim roasted it over an open fire and then ate it. Since everybody ate roasted marshmallows from the same box, the villain thought that the crime will not be traced.

QUESTION ON SECTION 6

14. Make your choice of the answer. The plot is

1. entirely reasonable—the victim would surely succumb after eating a marshmallow sprinkled with arsenic trioxide and then roasted ☐
2. entirely unreasonable—the victim would be completely safe in eating the roasted marshmallow that had been dusted with arsenic trioxide ☐
3. questionable—the victim might or might not succumb and the murderer might or might not be detected immediately ☐
4. unsound—because arsenic will be suspected and the victim will be safe even after eating the marshmallow ☐

BIOLOGY

Section 7

Lamarck's well-known theory of inheritance of acquired characters gave an explanation of origin of new species of animals and plants through the supposed direct action of the environment.

One objection to this Lamarckian concept is that, with the exception of certain biochemical effects, no mechanism has been discovered by which an acquired body character (somatoplasm) in a multicellular organism is able to modify the genes or chromosomes.

The theory of inheritance of acquired characters assumes the presence of such a mechanism. Our present-day knowledge of physiology and genetic system makes it seem unlikely that any such Lamarckian mechanism exists with the exception of certain biochemical effects already mentioned.

QUESTIONS ON SECTION 7

15. Lamarck enunciated the theory of acquired characters to explain

1. how an animal or plant gets adapted to its environment during its life time [ ]
2. the mechanism of transmission of characters from parent to offspring [ ]
3. the differences observed between parents and offspring [ ]
4. why some species of animals and plants continue to survive till to-day while others have become extinct [ ]

PART B– OPTIONAL
PHYSICS

FACTUAL TYPE

1. When a beam of white light passes through a prism, it splits up into different colours. Violet colour is bent most because

1. refractive index of glass for violet rays is larger than for other rays [ ]
2. refractive index of glass for violet rays is smaller than for other rays [ ]
3. refractive indices are all equal but violet rays have smaller wavelength [ ]
4. refractive indices are all equal but violet rays have longer wavelength [ ]

2. Two bodies, one held 1 metere directly above the other, are released simultaneously and fall freely under gravity. After two seconds their relatize separation will be

   1. 9.80 m ☐
   2. 4.90 m ☐
   3. 1.00 m ☐
   4. 0.98 m ☐

3. In a metal bar, the sound waves that propagate

   1. are always longitudinal ☐
   2. are always transverse ☐
   3. are always torsional ☐
   4. can be either longitudinal or transverse ☐

4. Cosmic rays refer to

   1. high energy charged particles coming from outer space ☐
   2. X-rays coming from the sun ☐
   3. X-rays coming from a star in the Milky Way ☐
   4. high energy uncharged particles coming from space ☐

THOUGHT TYPE

Section 8

Whenever a conductor passes through a magnetic field an electromotive force is generated in it. The electromotive force depends on the strength of the field and the speed at which the conductor moves. We can see, therefore, that the essentials of an electric generator or dynamo are powerful magnets and a rapidly moving coil.

QUESTIONS ON SECTION 8

5. The dynamo works on the principle of

   1. induced magnetism ☐
   2. induced electricity ☐
   3. electromagnetic induction ☐
   4. production of electricity by friction ☐

6. The dynamo

   1. creates electrical energy ☐
   2. converts mechanical energy into electrical energy ☐
   3. converts electrical energy into mechanical energy ☐
   4. converts chemical energy into electrical energy ☐

Section 9

After the discovery of X-rays, M. von Laue suggested in 1912 that X-rays are waves and therefore if atoms or molecules of crystals are arranged in a regular geometrical lattice, they ought to be capable of diffracting X-rays. Subsequent X-ray diffraction experiments confirmed his ideas and showed that the beauty of the crystals is not skin deep; the symmetries exhibited by the beautiful external forms arise from the internal structural symmetry. Further it is possible to measure interatomic distances. However X-ray diffraction gives no information about the outer atomic layers of a crystal, where the strain related to surface tension produces some variation in the spacing of atomic planes. These surface layers play a very important part in the growth of crystals because they act as collectors for fresh material. The electron diffraction technique has provided much information in this direction.

QUESTIONS ON SECTION 9

7. When an electron beam is incident on a crystal, it

1. cannot penetrate the crystal at all ☐
2. can penetrate to a depth of a few atomic dimensions ☐
3. can penetrate about a centimetre ☐
4. can penetrate any thickness ☐

CHEMISTRY
FACTUAL TYPE

8. Chemical reactions involve participation of

(a) electrons ☐
(b) protons ☐
(c) neutrons ☐
(d) mesons ☐

9. Addition of zinc powder to $CuSO_4$ solution precipitates copper due to

(a) reduction of Cu^{++} ☐
(b) reduction of $SO^{=}_4$ ☐
(c) reduction of Zn ☐
(d) hydrolysis of $CuSO_4$ ☐

10. The most common oxidation state of oxygen in compounds is—2. This is best explained as due to

(a) 2 electrons in its outermost orbit ☐
(b) 4 electrons in its outermost orbit ☐
(c) 6 electrons in its outermost orbit ☐
(d) 7 electrons in its outermost orbit ☐

11. Which of the following is a metalloid ?

(a) arsenic ☐
(b) brass ☐
(c) nickel ☐
(d) mercury ☐

12. "One gram molecule of a gas at S.T.P. occupies 22.4 litres," is derived from

(a) Dalton's law ☐
(b) Avogadro's hypothesis ☐
(c) Graham's law ☐
(d) Boyle's law ☐

13. H_2S in the presence of HCl precipitates II group not IV group in qualitative analysis of metals, as

(a) HCl activates H_2S ☐
(b) HCl increases concentration of Cl^- ☐
(c) HCl decreases concentration of $S^=$ ☐
(d) HCl lowers the solubility of H_2S in solution ☐

THOUGHT TYPE

Section 10

The halogens comprise a family of elements in the periodic table and include fluorine, chlorine, bromine and iodine. The group shows some remarkable similarities as well as some differences in chemical behaviour. The similarities are expected since the electron populations of the outer levels are analogous. The differences, too, are understandable in terms of the increases in nuclear charge, number of electrons, and atomic size, going from top to bottom of a column of the periodic table. Most of the reactions of the halogens are of the oxidation-reduction type. The oxidizing abilities and other chemical activities of the halogens decrease in a regular manner, with increasing atomic weights

QUESTIONS ON SECTION 10

14. Which of the halogens has the biggest atom ?

(a) F ☐
(b) Cl ☐
(c) Br ☐
(d) I ☐

15. Which is the best reducing agent?

(a) F^- ☐
(b) Cl^- ☐

(c) Br—
(d) I— [ ]

16. Which of the halogens will show the greatest affinity for hydrogen ?

(a) fluorine
(b) chlorine [ ]
(c) bromine [ ]
(d) iodine [ ]

BIOLOGY

FACTUAL TYPE

17. The principal water absorbing structure in mammals is the

(a) lung
(b) kidney [ ]
(c) intestine [ ]
(d) skin [ ]

18. Mammals are totally independent of water at the time of reproduction unlike lower chordates. The reproductive specialisation permitting this is

(a) internal fertilization
(b) yolk storage [ ]
(c) mammary glands [ ]
(d) development of a placenta [ ]

19. Which one of the following process is found only in animals ?

(a) hormonal regulation
(b) nervous control [ ]
(c) respiration [ ]
(d) diffusion [ ]

20. The undermentioned animals are all mammals except

(a) echidna
(b) dolphin [ ]
(c) anteater [ ]
(d) ostrich [ ]

21. In which of the following organisms are hormones normally absent ?

(a) monkey
(b) cat [ ]
(c) cockroach [ ]
(d) bacteria [ ]

22. Certain tissues in the body like muscle tissue are more active than others like connective tissue. If we examine a cell from muscle tissue we should expect the muscle cell to contain many

(a) nucleoli ☐
(b) centrioles ☐
(c) mitochondria ☐
(d) nuclei ☐

23. Which of the plants bear fibrous roots?

(a) maize ☐
(b) mustard ☐
(c) radish ☐
(d) potato ☐

24. What do you eat in an apple?

(a) thalamus ☐
(b) mesocarp ☐
(c) endosperm ☐
(d) epicarp ☐

25. Plants were given names in Latin by scientists because

(a) Latin was a comparatively simple language ☐
(b) in medical practice prescriptions were written in Latin ☐
(c) scientists liked to impress people with their knowledge ☐
(d) Latin was the common language known to scientists ☐

THOUGHT TYPE

Section 11

In nature, animals, plants and the non-living environment together exist in a perfectly integrated system—the ecosystem.

The ecosystem keeps elements like carbon, nitrogen and oxygen going in cycles by the living organisms. These cycles are controlled by temperature, humidity and solar energy.

The primary food producers in the ecosystem are the autotrophs or plants. The heterotrophs or animals depend upon plants for their food, either directly or indirectly.

Thus we see that the ecosystem involves organisms (organized into communities), energy, matter, cycles and climate all interacting with each other but kept in a state of 'balance' over long periods of time.

QUESTIONS ON SECTION 11

26. The source of energy in the ecosystem is

(a) decomposition of animals and plants by bacteria ☐
(b) photosynthesis by green plants ☐
(c) fermentation of sugars ☐
(d) sunlight ☐

27. The ecosystem exists in a state of 'balance.' Supposing one of the heterotrophs, say the rabbit, multiplies and increases in number suddenly, then

(a) the 'balance' will be permamently upset because the rabbits will eat all the grass in the system and die of starvation ☐
(b) the 'balance' will be restored by an increase in the wolf population ☐
(c) epidemics will break out in the rabbits and kill all of them ☐
(d) rabbits will start eating each other ☐

MATHEMATICS

FACTUAL TYPE

28. X, Y, Z are the middle points of the sides of a triangle ABC whose circumcentre is S; then

(a) S is the circumcentre of triangle XYZ ☐
(b) S is the nine-points-centre of triangle XYZ ☐
(c) S is orthocentre of triangle XYZ ☐
(d) S is the centroid of triangle XYZ ☐

29. The number 1^2, 2^2, 3^2,.....62^2, 63^2, 64^2, are entered in the squares of a chess (draughts) board one in each of the squares, the sum of the numbers in each one of the rows amount to the same sum, then this sum is

(a) 260^2 ☐
(b) 11180 ☐
(c) 22360 ☐
(d) 33440 ☐

30. There are a set of 9 coins all looking alike, exactly one among them being a false one of less weight than the others. A balance (with no weight) is provided and one has to find out in at most *two* weighings the false coin; then initially one weighs with

(a) 4 coins in each pan ☐
(b) 2 coins in each pan ☐
(c) 3 coins in each pan ☐
(d) 1 coin in each pan ☐

31. If θ is any angle then the smallest interval containing the value of $3\sin\theta + 4\cos\theta$ is

(a) (3, 7) ☐
(b) (—7, 7) ☐
(c) (—5, 5) ☐
(d) (—1, 7) ☐

THOUGHT TYPE

Section 12

Suppose an equilateral triangular plate is kept flat in one fixed position on a plane. We can remove the plate and keep it in the same position by permuting the vertices if necessary, in three ways if the two faces of the plate are not alike (say, coloured differently) and in six ways if the faces are alike. We can similarly find out the number of ways in which a regular solid can be placed in a given position in space.

QUESTIONS ON SECTION 12

32. A square plate with faces differently coloured can be placed in a given position in

(a) 2 ways ☐
(b) 8 ways ☐
(c) 16 ways ☐
(d) 4 ways ☐

33. A plate in the form of a regular hexagon with identically coloured faces can be placed in a given position in

(a) 6 ways ☐
(b) 12 ways ☐
(c) 9 ways ☐
(d) 36 ways ☐

34. A rectangular plate with differently coloured faces can be placed in a given position in

(a) 2 ways ☐
(b) 1 way only ☐
(c) 4 ways ☐
(d) 8 ways ☐

35. A (non-square) rhombus face with identically coloured faces can be placed in a given position in

(a) 1 way only ☐
(b) 4 ways ☐
(c) 6 ways ☐
(d) 2 ways ☐

APPENDIX III

SAMPLE TOPICS OF ESSAY TYPE TEST

Time—2 *hours* *Maximum Marks*—50

Note : Write an essay on *any one* of the following topics in about 2,000 words. You may draw diagrams to illustrate your answer. The essay may be written either in *English* or in a *regional language*.

1. Atomic energy and its uses.
2. Science and food production.
3. Micro-organisms and disease.
4. Chemistry and medicine.

APPENDIX IV

A PROJECT REPORT

WHY APPLES TURN BROWN

(WHEN CUT OPEN AND KEPT OUTSIDE)

Introduction

Although the universe is in a stock of flux, only a few of the infinitesimal changes are perceptible to the human eye like the alternation of day and night, birth and death and the browning of a sliced apple.

When an apple is sliced and kept on the table, its colour gradually changes from milky white to jaggery brown. Why and how does it happen ? The coloured slice in no way tastes different. If the coloured surface layer is peeled off or scrapped, down below it is white. This, though a common phenomenon, kindled my curiosity as to the cause of it and preventive measure, if any.

Design of Experiments

It was noticed that apples became brown only when they are cut and exposed to air, thus indicating that the colouring took place only on contact with the atmosphere and the factor (s) (the responsible factors) had something to do with the surroundings. The slicing of an apple involves many factors as given below :

(a) the object with which it is cut
(b) the surrounding atmosphere to which the cut pieces are exposed
(c) the light to which it is exposed

It was therefore planned to examine the effects of the above mentioned factors by a series of experiments. This forms phase I of the project.

Phase II of the project attempts to examine the biochemical and microbiological reactions involved in the colour change.

An examination of the above connective factors firstly led to the study of methods which would prevent the colouring phenomenon.

Functional aspect

The following are the different experiments carried out to understand the phenomenon of why a cut apple turns brown.

(a) *To find out whether the material with which an apple is cut affects browning or not ·*

A few apples were taken and each was cut with a different instrument. Apple I was cut with a stone, apple II with a knife and apple III with hand. The results and inferences were recorded.

(b) *To find out whether an apple turns brown because of the atmosphere to which it is exposed after being cut.*

To find out the effect of the atmosphere on pieces of cut apples. Some pieces of apples were kept in different jars containing one of the main constituents of air like

(1) Oxygen
(2) Nitrogen
(3) Carbon-di-Oxide
(4) Moisture

The experimental set-up was triplicated to avoid experimental error. The set up was as follows.

TYPE A

The jars contained Oxygen.

TYPE B

They contained Nitrogen.

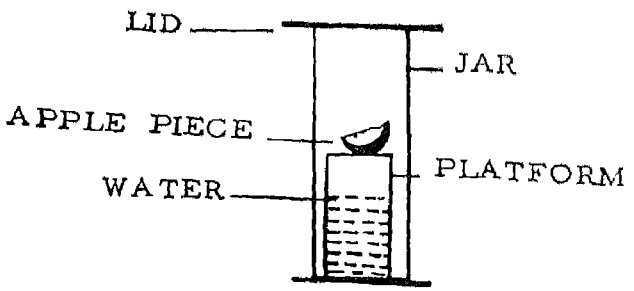
TYPE C

There jars contained Carbon-di-Oxide.

TYPE D

This also consisted of three jars filled partly with water. A raised platform was kept in the middle, on top of which the cut apple was kept. The platform was like an island in the middle. So the apple was not in contact with the water. (FIGURE I)

FIGURE- 1



This was the control having normal atmospheric conditions.

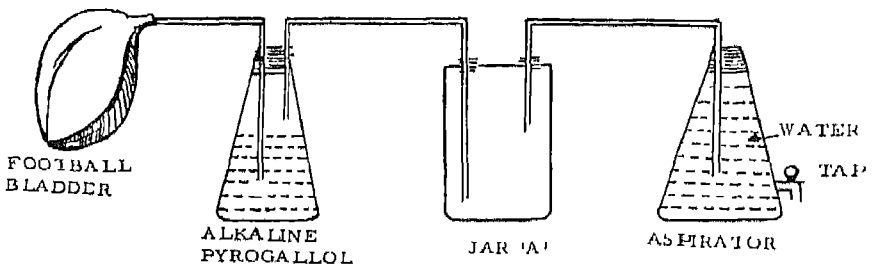
In each of the above cases, the apple was cut with a sterilised knife and slices were put in respective jars.

To confirm the results of the above experiments other experiments were planned. In all the experiments it was assumed that air was a simple mixture of Oxygen, Nitrogen, Carbon-di-oxide and water vapour. In the experiments given below, to study what part a particular external factor plays in browning of apples, the particular factor was removed. So the observations would indicate whether the factor is necessary or not for browning.

REMOVAL OF OXYGEN

It is known that alkaline pyrogallol absorbs oxygen. Hence an apparatus was designed which could remove oxygen from a particular jar attached to it. (Figure II).

FIGURE-II



A football bladder, full of air was attached to an 'L' shaped tube, which had its longer limb dipping in a solution of alkaline pyrogallol. This jar was connected to a jar A which was connected to an aspirator.

When the tap of the aspirator was opened, water flowed out and thus created vacuum in the jar. This vacuum was filled by air (from which O_2 was removed). The jar which had alkaline pyrogallol solution sucked air from the football bladder. In this way Jar A became filled with deoxygenated air. The apparatus was kept airtight with the help of vaseline.

As in the previous case a piece of apple cut with a sterilised knife was put inside and observations were recorded.

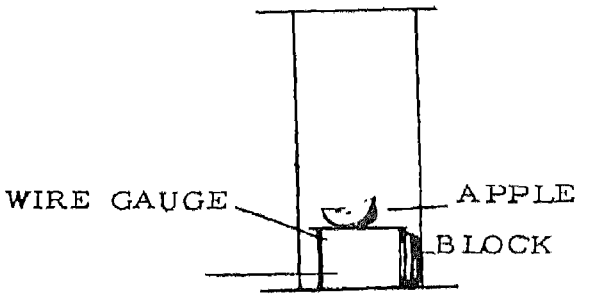
Removal of Nitrogen

No suitable method was found for removal of nitrogen. The difficulty arose because nitrogen is inert.

Removal of Carbon-di-oxide

Sodium hydroxide solid has a very great affinity with carbon-di-oxide so the gas was removed from the jar by the substance indicated above. To prevent contact between the chemical and the apple two blocks of wood were kept in the jar, which supported a wire gauze. On the wire gauze the apple was kept and below it, the chemical (FIGURE III).

FIGURE-III



APPARATUS FOR REMOVAL OF CO_2

Removal of Moisture

It was removed by using an arrangement similar to the one given above but instead of NaOH, a dehydrating agent (P_2O_5) was used. A piece of app'e was put inside and observation were recorded.

(c) *To find if light has any effect on browning.*

An apple was cut and kept in a dark place. Observations were then recorded.

Phase II

To find out whether the change was microbiological, an apple was cut and exposed to air when it had turned brown, a thin slice of the brown piece was taken. Attempts were made to cultivate it. There was also a plan to take an extract of the brown apple and inject it into a good unexposed apple. If the apple became brown, it would indicate that the browning was due to the above reason.

An apple was put into a pressure cooker and boiled. It was taken out and cut and exposed. The observations were then recorded.

To observe and record the substances which retard browning, several petri dishes were taken. In each of them were placed pieces of apples dipped in (1) dilute acid (2) dilute alkali (3) water and (4) sodium chloride solution. One of the petri dishes was kept under normal conditions (control). The observations were recorded.

COLLECTION OF DATA

PHASE—I

TYPE—A (OXYGEN)

JAR NUMBER	OBSERVATION	INFERENCE
JAR I	The apples turned brown.	Oxygen does not prevent browning
JAR II	The apples turned brown.	
JAR III	The apples turned brown.	

TYPE—B (NITROGEN)

JAR NUMBER	OBSERVATION	INFERENCE
JAR I	No browning	For reasons given under limitations, the first two results were taken. So N_2 does not help in browning.
	No browning	
JAR III	Slight browning	

TYPE—C (CARBON-DI-OXIDE)

JAR NUMBER	OBSERVATION	INFERENCE
JAR I	No browning	Carbon-di-oxide does not help in browning
JAR II	No browning	
JAR III	No browning	

TYPE—D (MOISTURE)

JAR NUMBER	OBSERVATION	INFERENCE
JAR I	The pieces turned brown.	Moisture does not prevent browning.
JAR II	The pieces turned brown	
JAR III	The pieces turned brown.	

CONTROL

JAR NUMBER	OBSERVATION	INFERENCE
JAR I	In all the three Jars the pieces became brown. Browning in Types A and D were more.	Oxygen and moisture help in browning.
JAR II		
JAR III		

EFFECT	COLLECTION OF DATA	(*Continued*)
CONDITION	**OF REMOVAL OF BROWNING OBSERVATION**	**OXYGEN ON**
Jar from which oxygen was removed	Browning was very little that too after an hour	**INFERENCE**
		Oxygen is necessary for browning.
EFFECT CONDITION	**OF REMOVAL OF CARBON-DI-OXIDE OBSERVATION**	**ON BROWNING INFERENCE**
Jar from which Co_2 was removed.	All the pieces became brown	Co_2 is not necessary for browning
EFFECT	**OF REMOVAL OFMOISTURE**	**ON BROWNING**
Jar from which moisture was removed.	All the pieces became brown	Moisture does not take any part in browning (please see 'LIMITATIONS')
EFFECT	**OF REMOVAL OF LIGHT**	**ON BROWNING**
Jar kept in darkness.	All the pieces became brown	Light does not take any part in browning
TEST	**PHASE—II OBSERVATION**	**INFERENCE**
1. Cultivation of brown layer in agar agar medium	Growth was not possible.	The change is not due to microbiological activity.
2 An apple boiled in a pressure cooker was cut open	The apple did not become brown at all.	The factor (s) responsible for browning is rendered inactive by boiling.

3. Piece of apple dipped in dilute acid.	The piece did not become brown at all.	The factor (s) responsible is rendered inactive by dilute acid.
4. Piece of apple dipped in dilute alkali.	The piece became yellow and then red.	The alkali has got some other chemical reaction with apple.
5. Piece of apple dipped in water.	It became brown very quickly.	Water helps in browning
6. Piece dipped in dilute salt solution	The piece did not become brown for a very long time.	Salt solution prevents browning.
7. Piece kept under normal conditions (Control)	The piece became brown.	On contact with the atmosphere the apple turns brown.

Interpretation of data

From the several observations made in phase I, it was deduced that oxygen is necessary for browning and browning is an oxidative reaction taking place in the presence of oxygen It was also seen that light does not play any part in the browning phenomenon, as equal colour change takes place in darkness also.

Observations of phase II show that browning is not due to microbiological activity. From the boiling test it was seen that the factor(s) responsible for browning are thermolabile.

It is therefore pertinent to infer that the browning of a cut apple exposed to air is the outcome of an oxidative reaction aided by enzymatic participation.

The retardation of browning in acid and saline treated pieces is a pointer towards preservation of cut apples by non-poisonous chemicals.

Limitations

1. In all the experiments conducted as shown above, the apple was cut in air and then put into the jars maintained under various conditions. So the apple piece may be affected by the atmosphere before being put inside the jar. This accounts for the slight browning in Type B jar III.

2. The other possibility why the piece of apple in Type B showed slight browning was because of water present in the jar (Nitrogen was collected by the downward displacement of water). In order to prevent contact with water an obstacle was put and the apple was kept on it. But this was not very effective.

3. The apparatus shown in figure II was not airtight even though the connections were plastered with vaseline. Hence the possibility of a little contamination may not be ruled out. This is supposed to have accounted for the slight browning.

4. A test was conducted to see whether the removal of moisture had any effect on browning. Although moisture was removed from the surrounding air, the apples were not dehydrated.

Summary

The aim of the project was to find out why a cut apple became brown when exposed to air. Experiments performed showed that oxygen was necessary and other experiments indicated that the factor (s) responsible for browning could be destroyed by boiling or by dilute acid or by saline treatment. It was inferred that the browning of a cut apple was probably due to the enzymatic oxidation of one of the constituents of the apple.

Conclusion

It is proposed to study the reaction more deeply and try to pinpoint what actually takes place during the browning of a cut apple. The reason why the deeper layers of the apple do not become brown is probably due to the anerobic condition inside the apple Nevertheless, the internal atmosphere of apples does contain oxygen but it appears that some other processes go on inside the apple at a much faster rate than the available O_2 for browning. This may perhaps be a respiratory activity.

The brown colour formation was noticed in other fruits like pear, brinjal etc. A pear has more or less the same composition as that of an apple. Experiments are also to be made to find out the factor (s) responsible for browning in these fruits. Further experimentation is needed to understand whether the biochemical reaction leading to browning in other fruits is the same as well as the end product (s).

Bibliography

1. Smock R.M. and Neubert A.M., 'Apple and Apple products'.

2. Taylor W.T. and Weber R.J. 1961, 'General Biology' pp. 945, Pub. Affiliated East West Press (D. Van Nostrand U.S.A.)

3. Meyer, Bernard and Anderson D, Plant Physiology pp. 748 Affiliated East West Press (D. Van Nostrand U.S.A. 1952.)

APPENDIX V

AREAWISE ITEMS OF THE SCIENCE APTITUDE TEST, 1966
PART—A (COMPULSORY)

Quoting actual number of Test Items from the Test alongwith the arrangement.

I	Physics	Chemistry	Biology	Mathematics	Astronomy
Thought Type Items	1-7 7)	8-14 (7)	15-23 (9)	24-30 (7)	31-35 (5)
Total	7	7	9	7	5

	Physiology & Hygiene	Bio-chemistry	Geology	Agriculture	Philosophy of Science
Thought Type Items	36-40 (5)	41-45 (5)	46-50 (5)	51-55 (5)	56-60 (5)
Total	5	5	5	5	5

	Engineering	Bio-Physics	Meteorology
Thought Type Items	61-65 (5)	66-70 (5)	71-75 (5)
Total	5	5	5

PART 'B' (OPTIONAL)

Quoting Actual Number of Test Items from the Test alongwith the arrangement.

	Physics	Chemistry	Biology	Mathematics
Factual Type Items	1-30 (30)	1-30 (30)	1-30 (30)	1-30 (30)
Thought Type Items	31-50 (20)	31-50 (20)	31-50 (20)	31-50 (20)
Total	50	50	50	50

APPENDIX VI (A)

THOUGHT TYPE ITEMS—AN ANALYSIS OF PART (A) OF THE SCIENCE APTITUDE TEST

Area	Serial of Sections	Number of Passages	Number of Items from each Area	Average number of Items per Passage
1	2	3	4	5
1. Physics	1-2	2	7	3.50
2. Chemistry	3-6	4	7	1.75
3. Biology	7-9	3	9	3.00
4. Mathematics	10-11	2	7	3.50
5. Astronomy	12-13	2	5	2.50
6. Physiology and Hygiene	14-15	2	5	2.50
7. Bio-Chemistry	16-17	2	5	2.50
8. Geology	18-19	2	5	2.50
9. Agriculture	20-23	4	5	1.25
10. Philosophy of Science	24-28	5	5	1.00
11. Engineering	29-30	2	5	2.50
12 Bio-Physics	31-32	2	5	2.50
13. Meteorology	33-34	2	5	2.50

APPENDIX VI (B)

THOUGHT TYPE ITEMS—AN ANALYSIS OF PART (B) OF THE SCIENCE APTITUDE TEST

Area	Serial of Sections	Number of Passages	Number of Items from each area	Average number of Items per Passage
1	2	3	4	5
1. Physics	1–6	6	20	3.33
2. Chemistry	1-6	6	20	3.33
3. Biology	1–6	6	20	3.33
4. Mathematics	1–4	4	20	5.00

APPENDIX (VII) (A)

DEPARTMENT OF SCIENCE EDUCATION

(National Council of Educational Research & Training)

SCIENCE TALENT SEARCH EXAMINATION

MERIT LIST, 1966

List of the candidates who have been selected for the award of scholarship and Certificate of merit under the Science Talent Search Examination, 1966. Their names have been arranged in order of merit

S. No.	Rank No.	Roll Number	Name of the Candidates	Marks obtained	From where Appeared		Course Joined
					Centre	State/ Territory	
1	2	3	4	5	6	7	8
1	1	3016	Sh. Harit Purushottamdas Trivedi	190	Ahmedabad	Gujarat	B.Sc
2.	2	9202	,, Ajay Shankar	181	Allahabad	U. P.	Inter. Sc.
3.	3	2836	,, Girish Bhatnagar	176	Delhi	Delhi	no reply
4.	3	4218	,, Rappal Krishnan Shankar	176	Bangalore	Mysore	B.Sc.
5	5	2089	,, E.V. Raman	173	Delhi	Delhi	Pre. Med.
6.	5	10562	,, Arun Kumar Agrawal	173	Lucknow	U. P.	Inter. Sc.
7.	5	4157	,, Satish Ramadhyani	173	Bangalore	Mysore	no reply
8	8	7448	,, Alok Kumar Bhargava	171	Debradun	U. P.	Engg.

1	2	3	4	5	6	7	8
9	9	261	,, Pradeep Kumar Sen Gupta	170	Calcutta	W.B.	B.Sc.
10	9	755	,, Kishore Bhattacharya	170	24 Parganas	,,	Engg.
11	11	2072	,, Jitendra Nath Gupta	168	Delhi	Delhi	Pre. Med.
12	12	2418	Km. Chhanda Chattopadhyaya	167	,,	,,	do
13	12	19722	Sh. Alok Kalia	167	Jabalpur	M. P.	no-reply
14	12	19151	,, Arjinder Singh Gulati	167	Delhi	Delhi	Engg.
15	15	2431	Km. Gunisha Singh	166	,,	,,	B.Sc.
16	16	371	Km. Sumita Basu	165	Calcutta	W.B.	do
17	16	738	Sh. Purenndu Chattopadhya	165	24-Parganas	,,	no-reply
18	16	13500	,, Jacob Thomas	165	Calicut	Kerala	Engg
19	19	3682	,, Anish Mohit Gupta	164	Nagpur	M.S.	no reply
20	19	4167	,, Vikram Chandrasekhar	164	Bangalore	Mysore	Engg.
21	21	1529	,, Suresh Chandra Mohanty	162	Cuttack	Orissa	B.Sc
22	22	2129	,, N.J. Krishnan	160	Delhi	Delhi	no reply
23	22	11503	,, Akash Ray Choudhury	160	Cuttack	Orissa	B.Sc.
24	22	11179	,, P.C. Krishna Variyar	160	Bhopal	M P.	Engg.
25	22	15176	,, Harsha Mukuno Dabholkar	160	Bombay	M.S.	do
26	22	9199	,, Pradipta Banerji	160	Allahabad	U.P.	no reply
27	27	2434	Km. Rekha Vasudeva	159	Delhi	Delhi	Pre-Med.
28	27	2429	Km. Asha Singhal	159	,,	,,	B.Sc.
29	27	3618	Sh. Dilip Shriniwas Dixit	159	Kolhapur	M.S.	do
30	30	2417	Km. Anjana Bhatt	158	Delhi	Delhi	Pre-Med.
31	30	14558	Sh. C. Pradeep	158	Tambaram	Madras	Engg.
32	32	11238	,, Maninder Singh	156	Jabalpur	M.P.	Not Joined

1	2	3	4	5	6	7	8
33	33	2419	Km. Indu Ahluwalia	155	Delhi	Delhi	Pre-Med
34	33	2100	Sh. K R Raman	155	,,	,,	Engg.
35	33	15016	Km. Lalita Janardan Kanetkar	155	Bombay	M.S.	B Sc
36	33	14133	,, Usha K. Menon	155	Madras	Madras	do
37	37	2124	Sh. K.R. Venkatachalam	154	Delhi	Delhi	Engg.
38	38	2412	Km. Asha Misra	153	,,	,,	Pre-Med.
39	38	2102	Sh. S. Rajan	153	,,	,,	Engg.
40	40	2413	Km. Jasjit Kaur	152	,,	,,	B.Sc
41	40	2069	Sh. Bipin Kumar	152	,,	,,	Other Scholarship
42	42	17833	,, Pradeep Kumar D Shah	151	,,	,,	Engg.
43	42	168	Km. Swapna Roy	151	Calcutta	W.B.	B Sc.
44	42	16054	Sh. Jayant Dattatarya Sardeshmukh	151	Nagpur	M.S.	no reply
45	42	4163	,, Srinivasan Rao	151	Bangalore	Mysore	Engg.
46	42	4172	,, Rajiv Chandra	151	,,	,,	B.Sc.
47	47	2416	Km. Rita Choudhuri	150	Delhi	Delhi	do
48	47	2437	,, Kamna Aggarwal	150	,,	,,	do
49	47	15236	Sh. Ashwini Kumar Sabharwal	150	,,	,,	no reply
50	47	15698	,, T B. Krishnamurthy	150	Calcutta	W B.	B.Sc.
51	51	2447	Km. Meena Mirchandani	149	Delhi	Delhi	no reply
52	51	7452	Sh. Krishna Venkataramany	149	Dehradun	U.P.	Inter. Sc
53	51	4171	Sh. Jawad Basith	149	Bangalore	Mysore	B Sc.
54	54	2415	Km. Sangha Mitra Dutta	148	Delhi	Delhi	do
55	54	2439	,, Suvra Sanyal	148	,,	,,	do

1	2	3	4	5	6	7	8
56	54	370	Km. Susmita Pramanik	148	Calcutta	W.B.	Inter. Sc.
57	54	3350	Sh. Udupa Shriram M.	148	Bombay	M.S.	no reply
58	54	14650	,, Dipankar Ganguly	148	Poona	,,	B.Sc.
59	59	2421	Km. Meera Hajela	147	Delhi	Delhi	Pre-Med.
60	59	2427	,, Rita Bahl	147	,,	,,	do
61	59	7457	Sh. Pritpal Singh Kochhar	147	Dehradun	U P.	Engg.
62	59	15537	Sh. Dara S. Amar	147	Bangalore	Mysore	Med. Course
63	63	2831	,, Rajeshwer Anand Kaushik	146	Delhi	Delhi	B.Sc.
64	63	18166	,, Kaicker Sudhir	146	,,	,,	do
65	63	173	,, Anol Nath Chatterji	146	Calcutta	W.B.	do
66	63	7458	,, Rajni Kant	146	Dehradun	U.P.	no reply
67	67	2430	Km. Prakash Chowdhary	145	Delhi	Delhi	B.Sc
68	67	2432	,, Sudha Sharma	145	,,	,,	Pre-Med.
69	67	2125	Sh. S. Balachandran	145	,,	,,	no-reply
70	67	196	Km. Rita Gupta	145	Calcutta	W.B.	Foreign Scholarship
71	67	3681	Sh. Sanjay Sukumar Mookerjee	145	Nagpur	M.S.	B.Sc.
72	67	6283	,, Satpal Singh	145	Amritsar	Punjab	Pre-Med.
73	73	18165	,, Master Chander Kiran	144	Delhi	Delhi	Engg.
74	73	19714	,, Vasudevan Rangaswamy	144	Jabalpur	M.P.	no reply
75	75	2075	,, Ravinder Nath Zutshi	143	Delhi	Delhi	Mech.(Engg)
76	75	2605	,, Rakesh Aggarwal	143	,,	,,	no reply
77	75	190	,, Smarajit Kumar Mitra	143	Calcutta	W.B.	B.Sc.
78	75	3351	,, Nori Madhav Vithal	143	Bombay	M S.	do

1	2	3	4	5	6	7	8
79	75	8267	,, Ajai Rastogi	143	Etah	U.P.	Inter. Sc.
80	80	2420	Km. Raman Chitkara	142	Delhi	Delhi	B.Sc.
81	80	2350	,, K.R. Radhika	142	,,	,,	no reply
82	80	15238	Sh. Ravinder Sethi	142	,,	,,	do
83	80	256	,, Harminder Singh Narula	142	Calcutta	W.B.	do
84	80	754	,, Bhaskar Basu	142	24-Parganas	W.B.	B.Sc.
85	80	3445	,, Karulkar Pramod Chintaman	142	Alibag	M.S.	do
86	80	7449	,, Arun Sudhakar	142	Dehradun	U.P.	Engg.
87	87	2428	Km. Meera Bhalla	141	Delhi	Delhi	B.Sc.
88	87	2450	,, Rita Bhatnagar	141	,,	,,	do
89	87	15315	Sh. Murlidhar Rao	141	,,	,,	do
90	87	191	,, Somsanker Das	141	Calcutta	W.B.	do
91	87	3082	,, Kamble Vinay Baburao	141	Junagadh	Gujrat	do
92	87	9200	,, Vivek Chandra Pande	141	Allahabad	U P.	no reply
93	87	5862	,, Hans Raj Chhaper	141	Jodhpur	Raj.	B.Sc.
94	94	2433	Km. Ratna Deepamajumder	140	Delhi	Delhi	do
95	94	2093	Sh. K. Murali	140	,,	,,	no reply
96	94	421	,, Abhijit Buxy	140	Calcutta	W.B.	Not eligible
97	94	15771	,, Pradeep Jaipuria	140	,,	,,	Engg.
98	98	2407	Km. Roopa Madan	139	Delhi	Delhi	B.Sc.
99	98	2655	,, Shashi Bala	139	,,	,,	B.Sc.
100	98	2337	Sh. Jitendra Singh	139	,,	,,	Not Joining
101	98	2368	,, L.R. Ganesh	139	,,	,,	B Sc.
102	98	18190	,, Shripad Digambar Tuljapulkar	139	,,	,,	Inter Sc.

1	2	3	4	5	6	7	8
103	98	15317	,, Umang Singh	139	,,	,,	Engg.
104	98	1400	,, Shib Shanar Bhattacharyya	139	Singhbhum	Bihar	B Sc.
105	98	1261	,, Tapan Kumar Pal	139	Ranchi	Bihar	no reply
106	98	8405	,, Umesh Chandra Goel	139	Moradabad	U.P.	Inter Sc.
107	98	8960	Km. Indira Singh	139	Kanpur	U.P.	do
108	98	10553	,, Kiran Kunwar	139	Lucknow	U.P.	do
109	109	2461	,, Bimal Kaicker	138	Delhi	Delhi	Eco. (Hons.)
110	109	2084	Sh S. Raghavan	138	,,	,,	Mech. Engg
111	109	2601	,, Subhash Chander Agarwal	138	,,	,,	B Sc.
112	109	2607	,, Sanjay Limaye	138	,,	,,	Inter Sc.
113	109	2272	Km. Usha Kiran	138	Delhi	Delhi	Pre-Med.
114	109	15201	Sh. Ravindra Nath Thakur	138	,,	,,	Engg.
115	109	174	,, Dipankar Chakravarti	138	Calcutta	W.B.	B Sc.
116	109	12869	,, Suresh Chandra Gupta	138	Ujjain	M.P.	do
117	109	11772	,, Rajni Kant Puranik	138	Durg	M.P.	do
118	109	3026	,, Desai Arun Kantilal	138	Ahmedabad	Gujarat	Engg.
119	109	4640	,, P.D.S. Gopal Krishna Rao	138	Rajahmundry	A.P.	do
120	109	14603	Km. K V. Shantha	138	Tiruchirapalli	Madras	B Sc.
121	109	13196	,, S. Rajan	138	Trivandrum	Kerala	do
122	109	2757	Sh. Anil Kumar Singh	138	Delhi	Delhi	no reply
123	123	2120	,, T. Shivdas Nair	137	,,	,,	do
124	123	18176	,, Harbinder Singh Gill	137	,,	,,	Engg.
125	123	257	,, Utpal Sen Gupta	137	Calcutta	W.B.	do
126	123	423	,, Shyam Kumaria	137	,,	,,	no reply

1	2	3	4	5	6	7	8
127	123	15770	,, Parthasarathi Ghosh	137	,,	,,	do
128	123	3716	,, Bhairao Mohanlal Bohra	137	Khamgaon	M.S.	B Sc.
129	123	3361	,, Hemant Vasant Desai	137	Bombay	M.S.	Inter. Sc.
130	130	2424	Km. Sudha Sanghi	136	Delhi	Delhi	no reply
131	130	2127	Sh. R. Narayanan	136	,,	,,	do
132	130	2760	,, Vinod Khanijo	136	,,	,,	do
133	130	2595	,, Arun Nayar	136	,,	,,	do
134	130	2367	,, P S. Jairam	136	,,	,,	B Sc.
135	130	742	,, Amitava Chatterjee	136	24-Parganas	W.B.	no reply
136	130	3356	,, Rao Dileep Ramrao	136	Bombay	M.S.	Inter. Sc
137	130	6722	,, Deepa Manchanda	136	Patiala	Pb.	Engg.
138	130	2282	,, Asho Kumar Sharma	136	Delhi	Delhi	B.Sc.
139	139	2500	Km. Shakuntla Bist	135	,,	,,	do
140	139	5967	Sh. Sujit Prakash Ohrie	135	,,	,,	Engg.
141	139	193	,, Prabhakar Dev	135	Calcutta	W.B.	B.Sc.
142	139	4632	,, A. Purushotham	135	Rajahmundry	A.P.	do
143	143	2438	Km. Neeta Seth	134	Delhi	Delhi	do
144	143	15223	Sh. Arun Bhatia	134	,,	,,	Engg.
145	143	403	Km. Anupa Bhaurmik	134	Calcutta	W.B.	B.Sc.
146	143	15699	Sh. A.K. Singhania	134	,,	,,	Engg.
147	143	1634	,, Partha Sarathi Biswas	134	Agartala	Tripura	B.Sc.
148	143	7024	,, Vinod Kumar Sawhney	134	Ambala	Punjab	Pre-Med.
149	143	4166	,, Arun Krishnaji Thakur	134	Bangalore	Mysore	Engg.
150	150	2448	Km Lalitha Kutty	133	Delhi	Delhi	no reply

1	2	3	4	5	6	7	8
151	150	2289	Sh. Sunad Biswas	133	,,	,,	do
152	150	18196	,, Davendra Mohan Abbey	133	,,	,,	Pre-Med.
153	150	4159	,, Ravindran Damodaran	133	Bangalore	Mysore	no reply
154	154	2086	,, R. Venkataraman	132	Delhi	Delhi	B.Sc.
155	154	15646	,, Siddharatha Bhattacharya	132	Calcutta	W.B.	do
156	156	2414	Km. Uma Singhal	131	Delhi	Delhi	do
157	156	2472	,, Ravinder Kaur Narang	131	,,	,,	Pre-Med.
158	156	2096	Sh. K.K. Srinivasan	131	,,	,,	B Sc.
159	156	15302	,, Hemant Vasant Nerurkar	131	,,	,,	do
160	156	606	,, Prabir Kumar Dutta	131	Burdwan	W.B.	do
161	156	197	Km. Lalu George	131	Calcutta	W.B.	no reply
162	156	334	Sh. Suhendu Mazumdar	131	,,	,,	do
163	156	11237	,, Mukesh Eswaran	131	Jabalpur	M.P.	do
164	156	9303	,, Anand Naithani	131	Allahabad	U.P.	Inter. Sc.
165	156	7455	,, Om Prakash Bhatt	131	Dehradun	U P.	do
166	156	13386	,, Abdul Rahiman K.	131	Calicut	Kerala	B.Sc.
167	167	4170	Km. Usha Jankiraman	130	Bangalore	Mysore	do
168	167	13446	Sh. George Varghese	130	Kottayam	Kerala	Other Scholarship
169	167	7473	Km. Madhu Mehta	130	Dehradun	U P	do
170	167	10575	Sh. Prashant Chandra Pande	130	Lucknow	U.P.	Inter. Sc.
170A	167		Km. Shobha Lal	130	Delhi	Delhi	B.Sc.
171	171	2138	Sh. R. Ramani	129	,,	,,	do
172	171	2953	,, Satish Kumar	129	,,	,,	no reply

1	2	3	4	5	6	7	8
173	171	15230	Km. Neerja Suchdev	129	Delhi	Delhi	Pre-Med.
174	171	826	Sh. Paritosh Kumar Basak	129	Hooghly	W.B.	B.Sc.
175	171	745	,, Ashis Kumar Guha	129	24-Parganas	,,	do
176	171	422	,, Ashok Kumar	129	Calcutta	,,	do
177	171	17973	Km. Usha Mahabal Hegde	129	Bombay	M.S.	Inter. Sc.
178	171	3688	Sh. Sohrab Daver	129	Nagpur	,,	B.Sc.
179	171	7451	,, Kunwar Kamal Jit Singh Dadwal	129	Dehradun	U.P.	N.D.A.
180	180	2027	,, Mahendra Kumar	128	Delhi	Delhi	Engg.
181	180	15244	,, Harjeet Singh	128	,,	,,	no reply
182	180	18170	,, Naresh Malhotra	128	,,	,,	Engg
183	180	322	,, Satya Narayan Purohit	128	Calcutta	W.B.	no reply
184	180	723	,, Robindra Bhowal	128	24-Parganas	,,	do
185	180	756	,, Pabak Chatterjee	128	,,	,,	B.Sc.
186	180	1484	,, Nikhilamohan Patnaik	128	Sambalpur	Orissa	do
187	180	5966	,, Krishna Chandra Verma	128	Delhi	Delhi	do
188	188	2423	Km Indu Dhingra	127	,,	,,	do
189	188	2435	,, Meenakshi Rampal	127	,,	,,	do
190	188	2085	Sh. K. Ravi	127	,,	,,	do
191	188	18201	,, Rahul Srivastava	127	,,	,,	do
192	188	429	,, John Bertram Geilekesy	127	Calcutta	W.B.	do
193	188	17974	,, Nair Sasidharan Balkrishnan	127	Bombay	M.S.	Not joining
194	194	2408	Km. Anjna Gupta	126	Delhi	Delhi	B.Sc.
195	194	2104	Sh. S. Venkataraman	126	,,	,,	Engg.
196	194	18175	,, Naresh Kumar Pruthi	126	,,	,,	Pre-med.

1	2	3	4	5	6	7	8
197	194	2333	,, Narendra Kumar Thapar	126	,,	,,	no reply
198	198	2436	Km. Gita Sood	125	,,	,,	Pre-Med.
199	198	2074	Sh. Vinod Kumar	125	,,	,,	Engg.
200	198	2837	,, Ranjan Saigal	125	,,	,,	no reply
201	198	2903	Km. Zohar Begum	125	,,	,,	Pre-Med.
202	198	18180	Sh. Ashok Bamzai	125	,,	,,	B.Sc.
203	198	15324	,, K. Krishna Mohan	125	Delhi	Delhi	Under Age
204	198	19137	Km. Shakuntala Rama Rao	125	,,	,,	Pre-med.
205	198	834	Sh. Shankar Prasad Bhattacharya	125	Hooghly	W.B.	B.Sc.
206	198	259	,, Ambar Ghosh	125	Calcutta	W.B.	do
207	198	309	,, Aditya Kumar Biswas	125	,,	,,	Engg.
208	198	1612	,, Prasana Kumar Tripathy	125	Dhenkanal	Orissa	B Sc.
209	198	11982	,, Sheel Kant Sharma	125	Seoni	M.P.	do
210	198	5863	,, Vijay Sharma	125	Bombay	M.S.	N.D.A.
211	198	15067	,, Joshi Prakash	125	,,	,,	Engg.
212	198	6431	,, Ashwani Kumar Garg	125	Jullundur	Punjab	no reply
213	213	2445	Km. Vinita Johri	124	Delhi	Delhi	B Sc.
214	213	2095	Sh. G. Vaidyanathan	124	,,	,,	
215	213	2886	,, Anupam Gupta	124	,,	,,	Mech. Engg.
216	213	829	,, Swapan Bhushan Ghosh Dastidar	124	Hooghly	W.B.	Engg.
217	213	38	,, Samar Jha	124	Calcutta	,,	B Sc.
218	213	176	,, Aloke Kumar Bose	124	,,	,,	Not joining
219	213	267	,, Kalyan Mondal	124	,,	,,	B.Sc.
220	213	336	,, Bimal Kumar Mukherjee	124	,,	,,	Engg.

1	2	3	4	5	6	7	8
221	213	30	,, Padmapani Mahanta	124	Jorhat	Assam	B.Sc.
222	213	11773	,, K.V. Subba Rao	124	Durg	M.P.	no reply
223	213	11977	,, Jay Narayan Lala	124	Seoni	M.P.	do
224	213	3311	,, Prabudha Ganguli	124	Bombay	M.S.	Inter. Sc.
225	213	3335	Km. Khanwalkar Sulabha Digambar	124	,,	,,	do
226	213	13411	Sh. N. Ramanathan	124	Ernaulam	Kerala	B.Sc.
227	213	18710	,, Arun Kumar Saxena	124	Agra	U.P.	Inter. Sc,
228	228	2440	Km. Promila Kapur	123	Delhi	Delhi	B.Sc.
229	228	2443	,, Rita Mehra	123	,,	,,	do
230	228	18162	Sh. Arup Kumar Ghosh	123	,,	,,	do
231	228	169	,, Subrata Halder	123	Calcutta	W B.	Engg.
232	228	11219	,, Suresh Kumar Pathak	123	Jabalpur	M.P.	B Sc.
233	228	15018	Sh. Krishnan Subramanian	123	Bombay	M.S	Inter. Sc
234	234	18279	Km. Renu Kumra	122	Delhi	Delhi	Pre-Med.
235	234	2023	Sh. Satish Taneja	122	,,	,,	Engg
236	234	2111	Km. V. Janavi	122	,,	,,	B.Sc.
237	234	2604	Sh. Pravin Kumar Gupta	122	,,	,,	do
238	234	797	,, Kalyan Kumar Deb	122	Hooghly	W B.	B Sc
239	234	594	,, Biswajit Deb	122	Burdwan	,,	do
240	234	4161	,, Amarnath Krishnaswamy	122	Bangalore	Mysore	Engg.
241	234	4180	,, N. Vijay Kumar	122	,,	,,	B.Sc.
242	234	13511	Km. Gita Rani Kavu	122	Palghat	Kerala	do
243	243	18762	Sh. Ashok Kumar Nadhani	121	Murshidabad	W.B	do
244	243	170	,, Pratyush Sen	121	Calcutta	W.B.	Engg.

1	2	3	4	5	6	7	8
245	243	9217	Km. Keya Sur	121	Allahabad	U P.	Inter. Sc.
246	243	6507	Sh. Mohan Singh Sangoo	121	Karnal	Punjab	B Sc
247	243	19080	Km. Indu Tewari	121	Delhi	Delhi	no reply
248	243	3024	Sh. Solanki Bharat Kantilal	121	Ahmedabad	Gujarat	do
249	249	2606	,, Ashok Kumar Gulati	120	Delhi	Delhi	do
250	249	15222	,, K. Hareesh Chandra Prabhu	120	,,	,,	Engg.
251	249	16117	Km. Sunita Kaushal Prasad Rao	120	Nagpur	M.S.	B Sc
252	249	8594	Sh. Charanjit Singh Bakshi	120	Bareilly	U P.	Inter. Sc.
253	249	13648	,, P M. Jos	120	Trichur	Kerala	B.Sc.
254	249	5896	,, Bharat Bhooshan	120	Kota	Raj.	do
255	255	2422	Km. Jugta Bedi	119	Delhi	Delhi	do
256	255	2442	,, Lata Nanchahal	119	,,	,,	no reply
257	255	2473	,, Madhu Wadhwa	119	,,	,,	B.Sc.
258	255	2126	Sh. R. Ravi	119	,,	,,	Pro. course
259	255	2145	,, B. Gangadhar	119	,,	,,	B Sc.
260	255	2526	,, Virander Singh Chauhan	119	,,	,,	do
261	255	2602	,, Mohendra Srivastava	119	,,	,,	Engg
262	255	2263	,, Dinesh Kumar Sharma	119	,,	,,	B.Sc
263	255	18164	,, Mahesh Doraiswamy	119	,,	,,	do
264	255	11766	,, Ravi Swaminathan	119	Durg	M.P.	Pro. course
265	255	12572	,, Arun Kumar Upadhya	119	Hoshangabad	,,	Engg
266	255	8512	,, Yash Pal Singh Satya	119	Bijnor	U.P.	Inter. Sc.
267	255	9203	,, Chandran Evenzer Azariah	119	Allahabad	,,	B.Sc.
268	255	9905	Km. Uma Elhence	119	Deoria	,,	Inter. Sc

1	2	3	4	5	6	7	8
269	255	6748	Sh. Gurinder Pal Singh	119	Patiala	Punjab	B Sc
270	255	4224	Km. Shobha Rajaram Bhalekar	119	Bangalore	Mysore	Med. course
271	255	13191	,, Annama Abraham	119	Trivendrum	Kerala	B Sc.
272	255	5955	Sh. Ashok Puri	119	Ajmer	Raj.	do
273	273	2462	Km. Chitra Narasimhan	118	Delhi	Delhi	do
274	273	2080	Sh. E.N Murthy	118	,,	,,	do
275	273	2594	,, Anand Kumar	118	,,	,,	no reply
276	273	2301	,, Kamal Kumar Sethi	118	,,	,,	Pre-Med
277	273	2320	,, Deepak Jain	118	,,	,,	Engg.
278	273	15307	,, Tiruvengadachari Ramaswamy	118	,,	,,	B Sc. Agrl.
279	273	19310	,, Sunil Kohli	118	,,	,,	B.Sc.
280	273	7300	,, Shankar Mitra	118	Calcutta	W.B	do
281	273	12926	,, Ravindra Khardekar	118	Ujjain	M.P.	do
282	273	3342	,, Milind Sharat Chandra Patankar	118	Bombay	M S	Engg.
283	273	13470	,; Venkitachalam P.P.	118	Calicut	Kerala	B Sc.
284	273	15330	,, M Surya Rao	118	Delhi	Delhi	do
285	285	2444	Km Swapna Banerjee	117	,,	,,	B.Sc.
286	285	2280	Sh. Akhelesh Saxena	117	,,	,,	not eligible
287	285	211	,, Om Prakash Jalan	117	Calcutta	W.B	B Sc
288	285	276	,, Avinash Gupta	117	,,	,,	Engg
289	285	400	Km. Joysree Ganguli	117	,,	,,	B Sc
290	285	14731	Sh B S. Rao Ravishankar	117	Madras	Madras	Agrl. Engg
291	285	11224	,, Rakesh Kumar Jain	117	Jabalpur	M.P.	no reply
292	285	11775	Km. Ajita Roy	117	Durg	,,	Pro course

1	2	3	4	5	6	7	8
293	285	15170	Sh. Vora Pramod Maganlal	117	Bombay	M.S	Inter. Sc.
294	285	3442	Sh. Kulkarni Anil Narayan	117	Alibag	M S.	B.Sc.
295	285	10657	,, Naresh Gupta	117	Lucknow	U P.	Inter. Sc.
296	285	6848	,, Vinod Kumar Taneja	117	Ferozepore	Punjab	Engg.
297	285	4189	Km. Rita Pathak	117	Bangalore	Mysore	B Sc.
298	285	5920	Sh. Ashok Suman	117	Kota	Raj.	Engg.
299	299	19223	,, Gurinder Singh Sandhu	116	Delhi	Delhi	no reply
300	299	2336	,, Anil Kumar Saxena	116	,,	,,	Engg.
301	299	2375	,, K. Jayaram	116	,,	,,	do
302	299	18747	,, Abhijit Das Gupta	116	Murshidabad	W.B	B Sc.
303	299	218	,, Jai Prakash Narain Kikan	116	Calcutta	,,	do
304	299	3518	Km Damle Shubha	116	Poona	M S.	do
305	299	3535	Sh. Arvind Changdeo Rane	116	,,	,,	do
306	299	9338	,, Subhash Chandra Atri	116	Allahabad	U P	Inter Sc.
307	299	8542	Km. Sushma Gupta	116	Rampur	U P.	do
308	299	8593	Sh. Anurag Mishra	116	Bareilly	U.P.	do
309	299	7441	,, Arunesh Kumar Bajaj	116	Varanasi	U P.	B.Sc.
310	299	4186	,, Narayanan Mohan	116	Bangalore	Mysore	do
311	299	4230	Km. B.L. Shiromani	116	,,	,,	do
312	229	13513	,, Prabha R.	116	Palghat	Kerala	do
313	299	17252	,, Preety Rani	116	Ernakulam	,,	do
214	299	13961	Sh. N.S. Vidyasagaran	116	Trichur	,,	no reply
315	299	5957	,, Swaminathan Shastri	116	Ajmer	Raj.	B.Sc.
316	316	2010	Km. Anita Sethti	115	Delhi	Delhi	no reply

1	2	3	4	5	6	7	8
317	316	2108	,, V. Danyela Rao	115	,,	,,	B Sc.
318	316	2370	,, C.R Saroj	115	,,	,,	do
319	316	15218	Sh. Radhey Shyam	115	,,	,,	do
320	316	807	Km. Nandita Bhattacharyya	115	Hooghly	W.B.	do
321	316	597	Sh. Samir Chowdhury	115	Burdwan	W.B.	no-reply
322	316	15647	,, Rabindra Nath Pal	115	Calcutta	W B.	B Sc.
323	316	743	,, Subrata Bhattacharya	115	24-Parganas	W.B.	Engg.
324	316	17303	,, Chakra Pani Singh	115	Palamau	Bihar	no-reply
325	316	12933	,, Lalit Kumar A. Pandya	115	Ujjain	M.P.	B.Sc.
326	326	3481	,, Wagulde Ramesh Damodar	115	Jalgaon	M.S	B.Sc.
327	326	8406	,, Hareshwar Swarup Saharia	115	Moradabad	U.P.	Inter Sc.
328	326	7505	,, Sudhia Kumar Barthwal	115	Dehradun	U.P.	do
329	326	7432	,, Inderjit Singh	115	Lucknow	U.P.	no reply
330	326	13416	,, Mohandas P.	115	Ernakulam	Kerala	B.Sc.
331	331	2493	Km. Radha Raman	114	Delhi	Delhi	Pre-Med.
332	331	17910	Sh. Ramesh Chand Rustogi	114	,,	,,	Engg.
333	331	2908	,, Rajesh Kumar Dhingra	114	,,	,,	do
334	331	2294	,, Vijay Sehgal	114	,,	,,	do
335	331	2325	,, Vinod Kumar Gupta	114	,,	,,	B.Sc.
336	331	583	Km. Madhumala Roy	114	Burdwan	W.B	do
337	337	716	Sh. Harshit Majumdar	114	24-Parganas	W.B.	Inter.Sc.
338	337	15043	Km. Olivia Pereira	114	Bombay	M.S.	B.Sc.
339	337	3018	Sh. Shah Murugesh Kantilal	114	Ahmedabad	Gujarat	Inter.Sc.
340	337	9466	,, Rajendra Kumar Shukla	114	Varanasi	U P.	no-reply

1	2	3	4	5	6	7	1
341	337	6668	„ Shashi Bhushan Mahen	114	Simla	Punjab	B.Sc
342	342	2007	„ Arun Kant Sharda	113	Delhi	Delhi	Engg.
343	342	2068	„ Chander Shekar Arora	113	„	„	Engg
344	342	2078	„ Satish Chander Malhotra	113	„	„	do
345	342	2101	„ N. Venkatesh	113	„	„	do
346	342	2105	Km. S Prema	113	„	„	B.Sc.
347	342	2759	Sh. Anoop Kapoor	113	„	„	Pre-Med
348	342	15295	„ Srikante Visweswariah	113	„	„	Engg.
349	342	402	Km. Atreyee Mandal	113	Calcutta	W.B.	B.Sc
350	342	15185	Sh. Rajeev Pundalik	113	Bombay	M S.	Inter Sc.
351	342	6416	„ Vijay Kumar Bhalla	113	Jullundur	Punjab	no reply
352	342	17178	„ T.N.C. Venkatesan	113	Tambaram	Madras	B.Sc.
353	342	2296	„ Harish Chander Dhamija	113	Delhi	Delhi	no reply

APPENDIX (VII) B

ANALYLIS OF THE MERIT LIST, TAKING SLAB OF 50 RANKS IN SIX GROUPS & A SLAB OF 54 RANKS IN THE 7th GROUP (IN ORDER OF MERIT) TO INDICATE THE EDUCATIONAL COURSES OPTED BY THE AWARDEES

Course opted	1-50	51-100	101-150	151-200	201-250	251-300	301-354	% age
1. B.Sc.	17	23	17	23	20	24	25	
2. Inter Science	2	3	9	4	5	5	8	Basic Sciences=62 %
3. Pre-Medical	7	4	2	5	4	3	3	Engineering Technology =18% Professional Courses
4. Engineering & Technology	13	5	10	4	8	7	10	
5. Arts	...	...	1	1	...	...	...	
6. Not eligible	...	1	...	...	...	1	-	
7. No reply	9	11	11	10	10	5	8	
8. Underage	...	...	..	...	1	..	...	
9. Not Joining (Other scholarships)	1	1	...	3	1	...	...	
10. Joined foreign University in Basic Science	1	1	..	...	...	..	...	
11. Professional course	...	1	..	...	..	5	...	
12. N D.A.	...	..	...	...	1	...	...	
Total	50	50	50	50	50	50	54	

Total 354

APPENDIX (VIII)

ANALYSIS FOR N.S.T.S. EXAMINATION 1966

State	No. of Examinees	Boys	Girls	Boys called for interview	Girls called for interview	Selected Boys (Awardees)	Selected Girls (Awardees)
1. A.P.	204	164	40	20	2	2	...
2. Assam	63	58	5	9	2	1	...
3. Bihar	104	99	5	22	...	3	...
4. Gujarat	56	42	14	11	4	5	...
5. J & K.	11	11	...	...	...	..	..
6. Kerala	141	82	59	44	30	8	5
7. M.P.	652	530	122	51	4	16	1
8. Madras	248	149	99	28	21	3	2
9. M S.	298	179	119	45	17	24	6
10. Mysore	101	64	37	23	13	12	4
11. Orissa	23	21	2	9	...	4	...
12. Punjab	219	195	24	48	5	9	...
13. Rajasthan	208	193	15	15	...	5	..
14. U.P.	845	694	151	69	13	27	6
15. W.B.	240	216	24	97	18	50	10
16. Delhi	572	359	213	228	107	95	55
17. Himachal Pradesh	4	4	...	1	...	..	..
18. Manipur	5	5	...	1	...	...	..
19. Tripura	17	15	2	1	...	1	...
20. Panjim	2	2	...	2	...	...	...
21. Pondichery	10	9	1	2	1	...	..
22. Port-Blair	2	2	...	...	...	...	..
Total	4025	3093	932	726	237	265	89

APPENDIX (IX)

SCIENCE TALENT SEARCH EXAMINATION 1966

Total Candidates appeared =4025

Selected = 354

S.N.	Appeared from the State/Territory	No. of Candidates appeared	Selected for interview	Selection Ratio Statewise	Finally selected for the award	Selection Ratio Statewise	Distribution of awardees Statewise
		1	2	3	4	5	6
1.	Andhra Pradesh	204	22	10%	2	1%	0.6%
2.	Assam	63	11	17%	1	1.6%	0.3%
3.	Bihar	104	22	21%	3	3.0%	0 85%
4.	Gujarat	56	15	27%	5	9%	1.50%
5.	Jammu & Kashmir	11	Nil	0%	...	0%	...
6.	Kerala	141	74	52%	13	9.0%	3 65%
7.	Madhya Pradesh	652	55	8%	17	2.7%	4.8%
8	Madras	248	49	20%	5	2.0%	1 50%
9.	Maharashtra	298	62	21%	30	10%	8.50%
10.	Mysore	101	36	36%	16	6.2%	4.50%
11.	Orissa	23	9	40%	4	17.5%	1.2%
12.	Punjab	219	53	24%	9	4.1%	2.55%
13.	Rajasthan	208	15	7%	5	2.3%	1.50%
14.	Uttar Pradesh	845	82	10%	33	4.0%	9.5%
15.	West Bengal	240	115	48%	60	25 0%	17 0%
16.	Delhi	572	335	59%	150	26.0%	41.8%

S. No.	Appeared from the State/Territory	No. of Candidates appeared.	Selected for interwiew	Selection Ratio Statewise	Finally selected for the award	Selection Ratio Statewise	Distribution of awardees Statewise
		1	2	3	4	5	6
17.	Himachal Pradesh	4	1	25%	...	0.0%	...
18.	Manipur	5	1	20%	...	0%	...
19.	Tripura	17	1	6%	1	6%	0 3%
20.	Panjim	2	2	100%	...	0%	...
21.	Pondicherry	10	3	33%	...	0%	...
22.	Port-Blair.	2	Nil	0%	...	0%	...
	Total	4025	963		354		


NUMBER OF AWARDEES
(204) (63) (
2
1
A.P. ASSAM BI

APPENDIX (X)

S.No.	State/Territory	National Scholarship Scheme 1966-67	National Science Scheme Year 1964	Talent Search Year 1965	Year 1966.
1.	Andhra Pradesh	7.56%	0.85%	1.23%	0.6%
2.	Assam	2 62%	2.26%	2.15%	0.3%
3.	Bihar	9.92%	1.13%	4.00%	0.85%
4	Gujarat	4.51%	2.00%	——	1 50%
5.	Jammu & Kashmir	0.74%	—	—	—
6.	Kerala	3.65%	—	0.31%	3 65%
7.	Madhya Pradesh	6.98%	7.62%	0.62%	4.80%
8.	Madras	6.98%	3.95%	4.00%	1.50%
9.	Maharashtra	8.58%	10.45%	11.08%	8.50%
10.	Mysore	5.06%	3.11%	7.08%	4.50%
11.	Orissa	3.75%	2.00%	1.85%	1.2%
12.	Punjab	4.51%	11.02%	3.38%	2.55%
13.	Rajasthan	4.45%	1.13%	1.54%	1.50%
14.	Uttar Pradesh	15.72%	13.81%	8.31%	9.5%
15.	West Bengal	7.62%	10.17%	23.69%	17%
16.	Delhi	0.65%	29.38%	29.85%	41.8%
17.	Himachal Pradesh	0.29%	—	—	—
18.	Manipur	0.20%	0.28%	—	—
19	Tripura	0.25%	—	0.62%	0.3%
20.	Panjim	0.13%	0.28%	0.31%	—
21.	Pondicherry	0.65%	0.56%	—	—
22.	Andaman Nicobar	0.03%	—	—	—
23.	Naga Land	0.70%	—	—	—
24.	N.E.F.A.	0.65%	—	—	—
25.	Award for unrepresented examination	0.77%	—	—	—
26.	Award for possible Bracketed Candidates.	2.82%	—	—	—

APPENDIX (XI) (A)

MEASURES OF CENTRAL TENDENCY AND VARIABILITY OF SCORES INTERVIEW—BOARD WISE (ZONAL)

Name of the Boards

Name of the Test	Statistic	Bangalore Board	Bombay Board	Calcutta Board	Delhi Board	Dehra-dun Board	Pooled
Science Aptitude test Total marks (125)	Mean	61.21 (49%)	57 80 (46.2%)	63.32 (50.6%)	66 87 (53.6%)	56.50 (45.2%)	62.60 (50%)
	S D.	18.97	15 10	16.64	15 25	14.64	15.86
	S E.m	1 56	1.40	1.42	82	1.24	0.50
	$S E_{S.D}$	1.10	.98	1.00	.58	0.87	0 35
Essay Paper Total Marks (50)	Mean	25.05 (50%)	23.81 (47.6%)	23 23 (46.5%)	23.67 (47.3%)	28 37 (56.6%	24 6 (49 2%)
	S.D.	8.04	8 6	7 58	6.42	7 05	7.90
	S E.m	0 66	0 80	0.65	0.34	0.60	0.26
	$S E_{S.D}$	0.47	0 56	0.46	0,24	0 42	0.18
	$V(\frac{S.D}{\bar{x}})\%$	32.1%	36.1%	32.6 %	27.1 %	24.8 %	32 1 %
Project Report Total Marks (25)	Mean	10 18 (40.7%)	10 76 (43%)	11.63 (46 5%)	9 82 (39 3%)	10 36 (41.4%)	10 36 (41.4%)
	S D.	3.51	4.10	3.53	3.32	4 53	3 86
	S.E.m	0 29	0 38	0 30	.18	0 38	0.13
	$S.E_{S.D}$	20	0 27	0.21	14	0.27	0.09
Interview Total Marks (50)	Mean	8.05 (16%)	24 30 (48 6%)	19 57 (39%)	15 75 (31 5%)	16 51 (33%)	16.40 (32 8%
	S.D.	7.88	11 32	7.14	6.35	7.85	9.3
	Skewness	1.88	0.03	0.80	1.33	1.38	0.85
	S.E.m	0 65	1.07	0.65	0.36	0.70	0.32
	$S.E_{S.D}$	0 46	0.76	0.46	0.25	0.49	0.23
Aggregate Score Total Marks (250)	Mean	102.65 (41%)	114.80 (46%)	116.00 (46.4%)	114.50 (45.8%)	109.40 (43.7%)	111.96 (44.7%)
	S.D.	21 8	22.0	20.0	21.42	20.7	21.75
	Skewness	1 25	0.81	0.66	0.53	0.94	0.71
	S E.m	1.80	2 09	1.71	1.21	1.86	0.75
	$S.E_{S.D}$	1.27	1.48	1.20	0.85	1.31	0.53

XI (B) FREQUENCY DISTRIBUTIONS

(I) Frequency Distribution of Scores on S A.T. for Candidates interviewed at different Boards

C.I.	Bangalore Board 1	Calcutta Board 2	Delhi Board 3	Bombay Board 4	Dehradun Board 5	Grand Total 6
100-109	3	—	2	—	1	6
90-99	2	9	26	4	2	43
80-89	17	16	46	8	7	94
70-79	19	28	72	11	19	149
60-69	36	22	84	25	20	187
50-59	34	29	66	31	36	196
40-49	28	23	44	25	42	162
30-39	10	8	2	12	11	43
20-29	—	1	2	—	—	3
Total	149	136	344	116	138	883

(ii) **Frequency Distribution of Scores on Essay Paper For Candidates interviewed at different Boards**

C.I.	Bangalore Board 1	Calcutta Board 2	Delhi Board 3	Bombay Board 4	Dehradun Board 5	Grand Total 6
45-49	—	—	2	—	—	2
40-44	4	3	1	7	5	20
35-39	16	6	16	6	27	71
30-34	27	25	40	16	24	132
25-29	32	21	76	21	48	198
20-24	26	36	128	27	18	233
15-19	31	28	66	26	12	165
10-14	11	14	8	9	3	45
5-9	2	2	7	3	1	15
0-4	—	1	—	1	—	2
Total	149	136	344	116	138	883

(iii) Frequency Distribution of Scores on Project Report For Candidates interviewed at different Boards

C.I.	Bangalore Board I	Calcutta Board II	Delhi Board III	Bombay Board IV	Dehradun Board V	Grand Total VI
23-24	—	—	2	—	—	2
21-22	1	1	—	2	—	4
19-20	6	2	6	6	8	28
17-18	4	5	11	5	5	30
15-16	9	21	11	12	16	69
13-14	13	26	21	8	12	80
11-12	26	35	57	27	27	172
9-10	43	24	120	21	18	226
7-8	22	6	78	14	20	140
5-6	19	13	29	13	19	93
3-4	4	3	7	4	10	28
1-2	2	—	2	4	3	11
Total	149	136	344	116	138	883

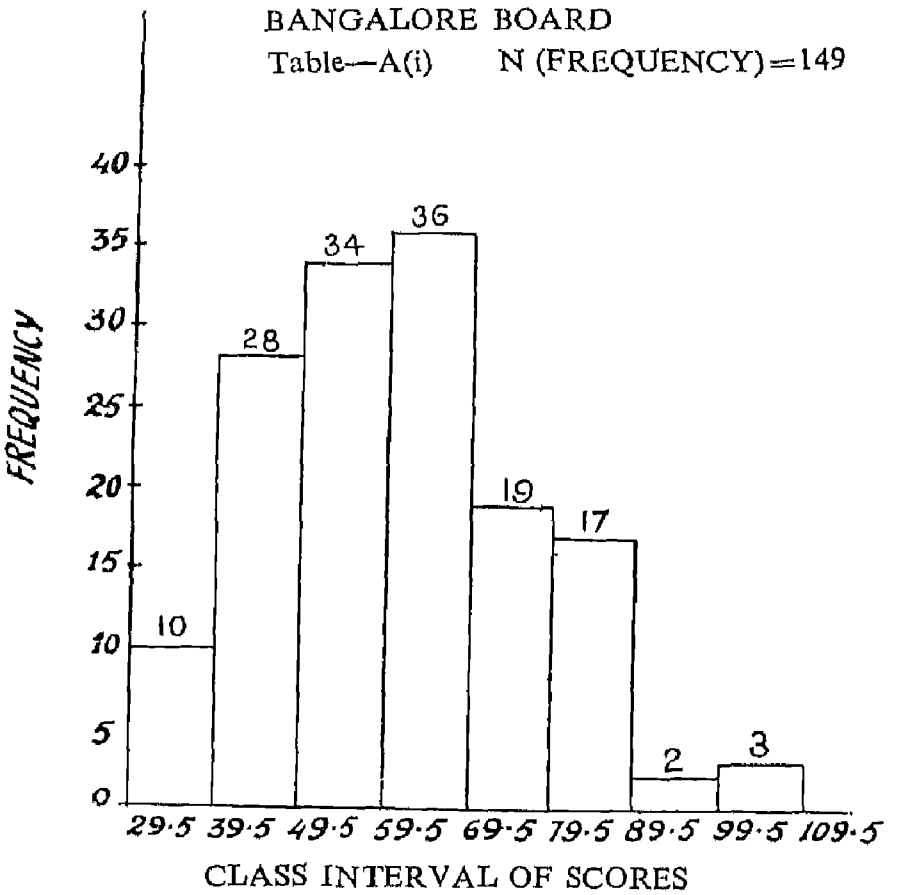
(iv) **Frequency Distribution of Scores on Interview For Candidates interviewed at different Boards**

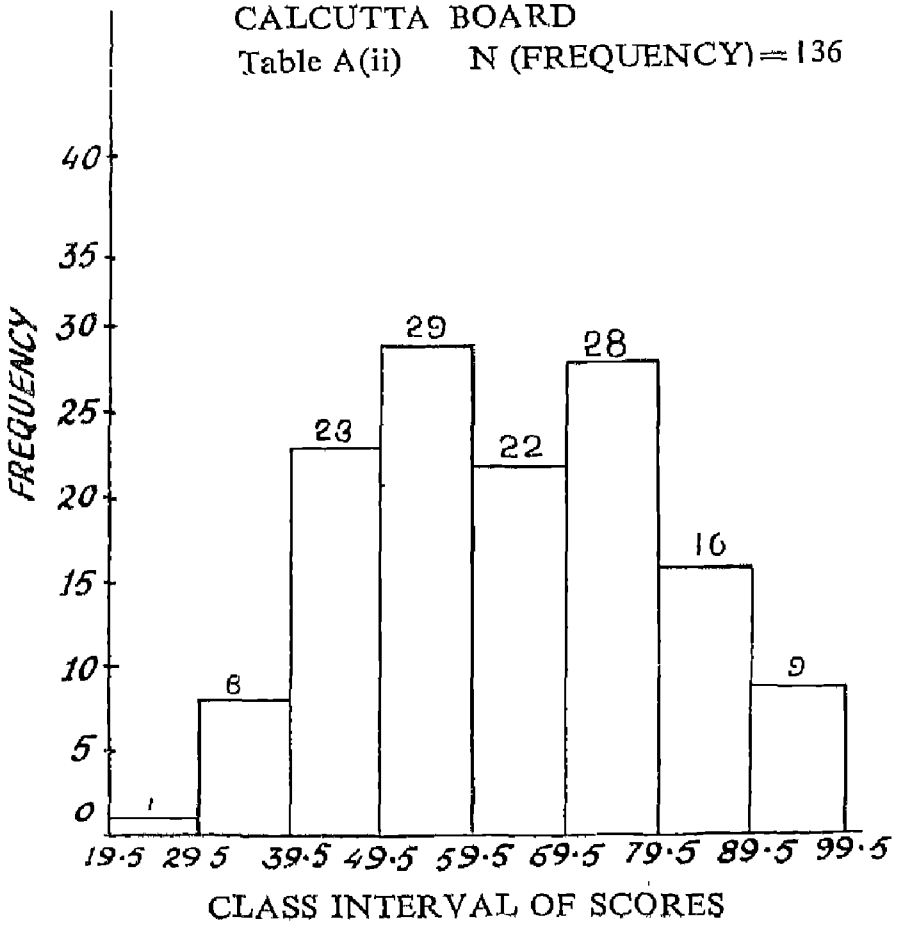
C.I.	Bangalore Board I	Calcutta Board II	Delhi Board III	Bombay Board IV	Dehradun Board V	Grand Total VI
45-49	—	—	—	2	—	2
40-44	—	—	—	11	2	13
35-39	1	7	2	11	2	23
30-34	4	6	10	14	8	42
25-29	3	19	19	16	10	67
20-24	6	29	42	18	13	108
15-19	10	32	84	12	22	160
10-14	19	43	116	16	45	239
5-9	35	—	37	8	21	101
0-4	65	—	2	3	—	70
Total	143	136	312	111	123	825

(v) **Frequency Distribution of the Scores on the whole Test for Candidates interviewed at different Boards**

C I.	Bangalore Board I	Calcutta Board II	Delhi Board III	Bombay Board IV	Dehradun Board V	Grand Total VI
185-194	—	—	—	1	—	1
175-184	1	—	1	—	1	3
165-174	2	4	5	1	2	14
155-164	3	2	6	6	1	18
145-154	3	5	19	4	4	35
135-144	4	14	35	10	7	70
125-134	5	19	30	7	10	71
115-124	16	23	42	20	17	118
105-114	22	17	49	19	23	130
95-104	21	35	65	25	23	169
85-94	37	17	51	14	28	147
75-84	29	—	9	4	7	49
Total	143	136	312	111	123	825

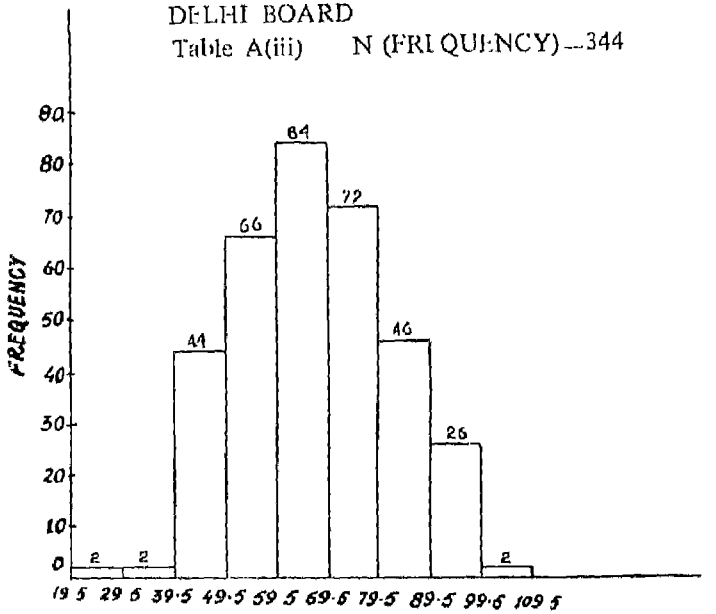
FREQUENCY DISTRIBUTION OF SCORES ON S.A.T. FOR CANDIDATES INTERVIEWED AT DIFFERENT BOARDS




CALCUTTA BOARD
Table A(ii) N (FREQUENCY) = 136
FREQUENCY
40
35
30
25
20
15
10
5
0
1
6
23
29
22
28
16
9
19·5 29 5 39·5 49·5 59·5 69·5 79·5 89·5 99·5
CLASS INTERVAL OF SCORES

DELHI BOARD

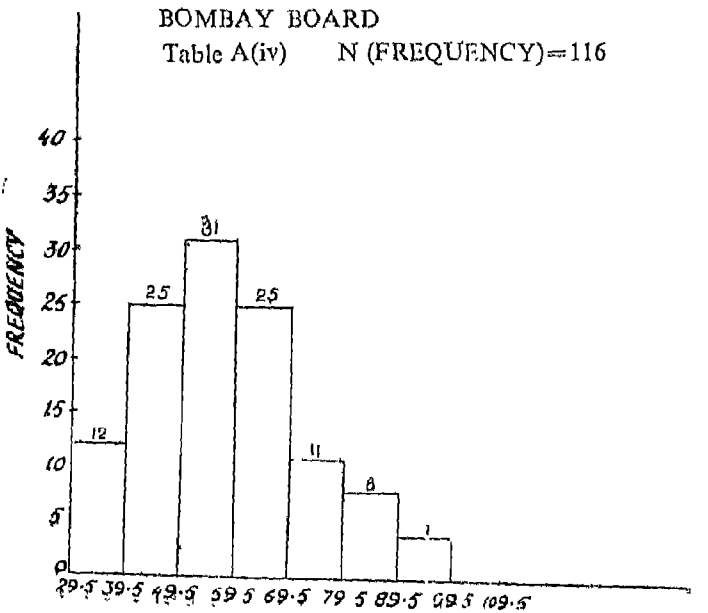
Table A(iii) N (FREQUENCY)=344



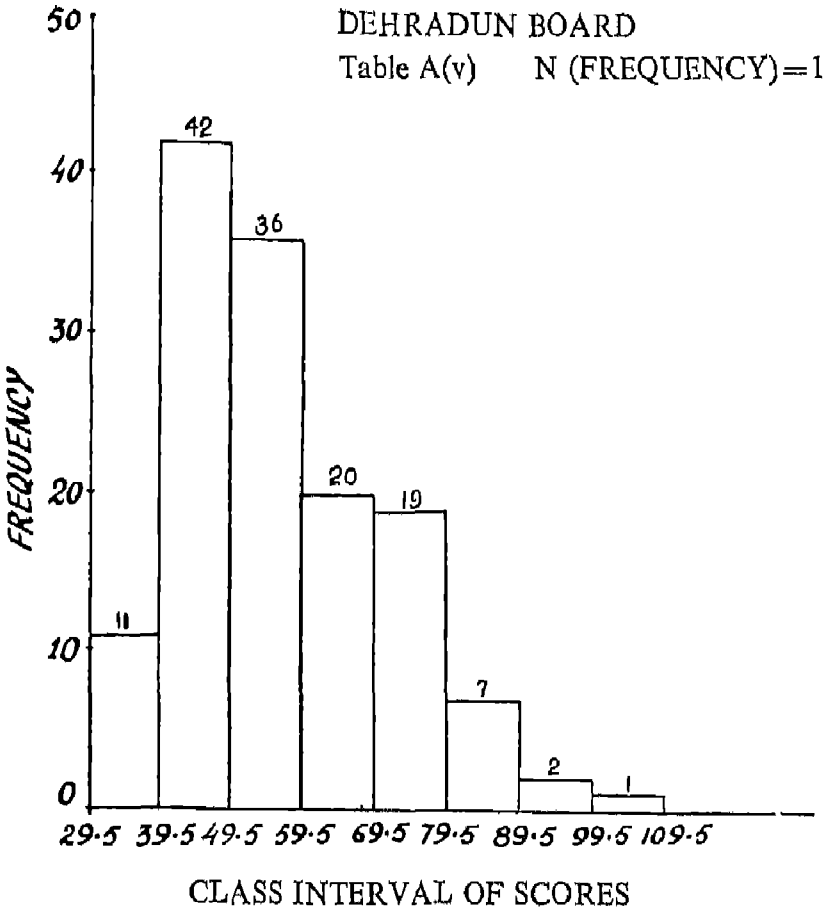
CLASS INTERVAL OF SCORES

BOMBAY BOARD

Table A(iv) N (FREQUENCY)=116

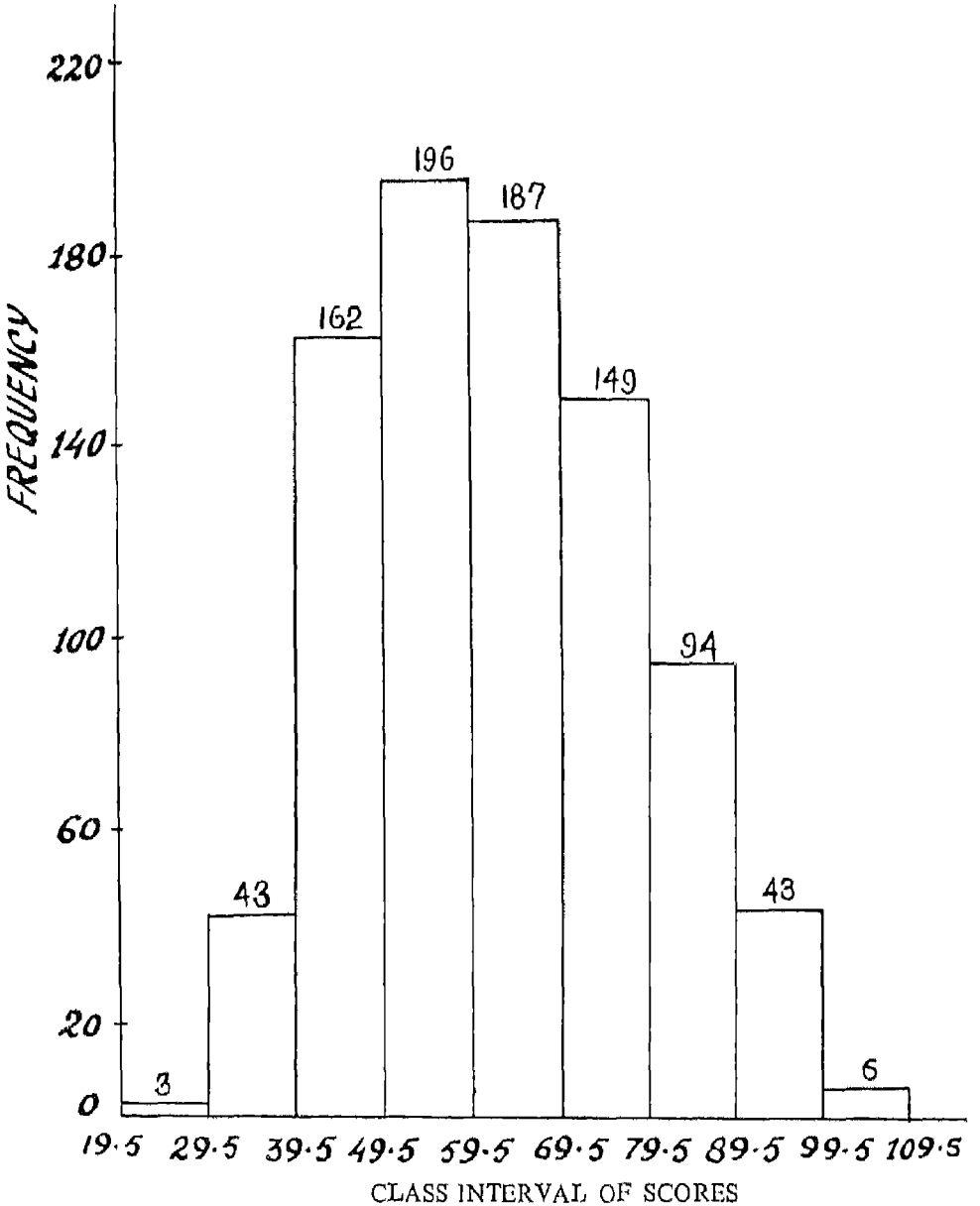


CLASS INTERVAL OF SCORES

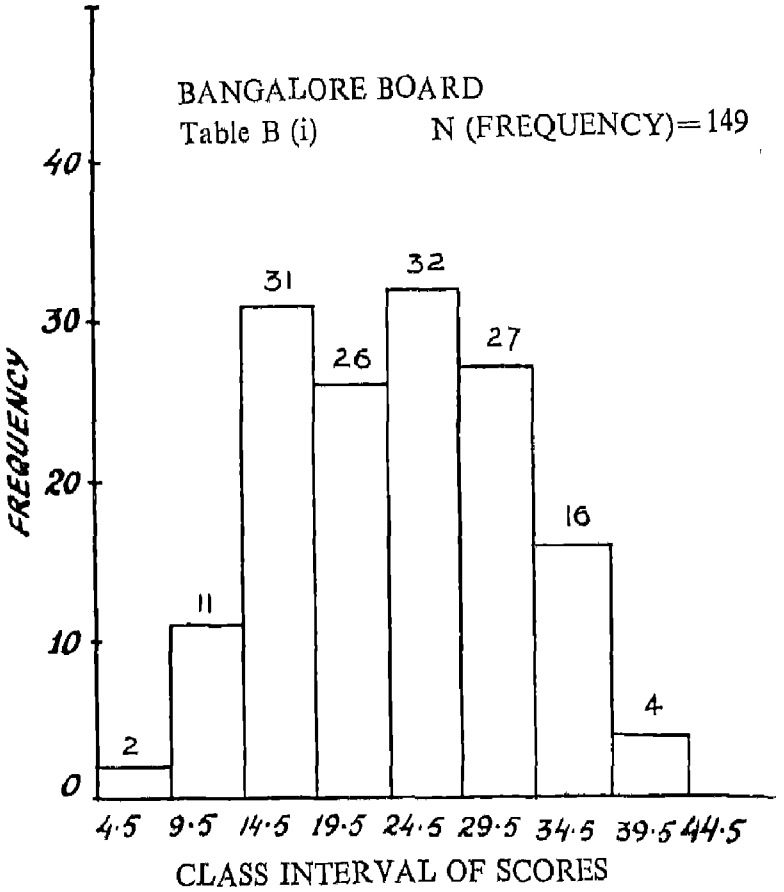

DEHRADUN BOARD
Table A(v) N (FREQUENCY)=138
FREQUENCY
50
40
30
20
10
0
42
36
20
19
11
7
2
1
29·5 39·5 49·5 59·5 69·5 79·5 89·5 99·5 109·5
CLASS INTERVAL OF SCORES

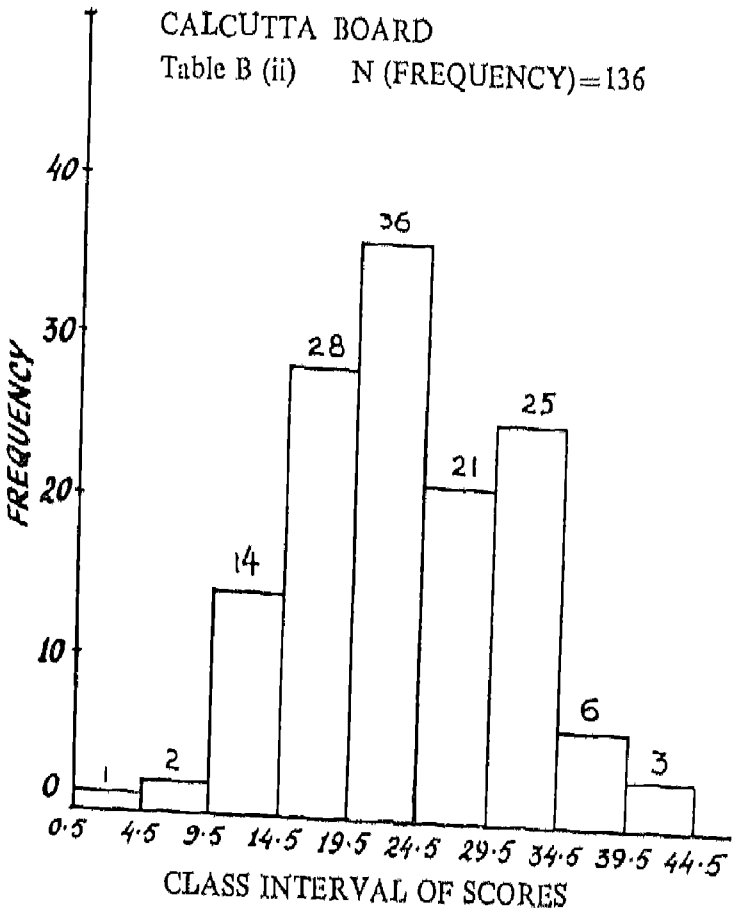
GRAND TOTAL

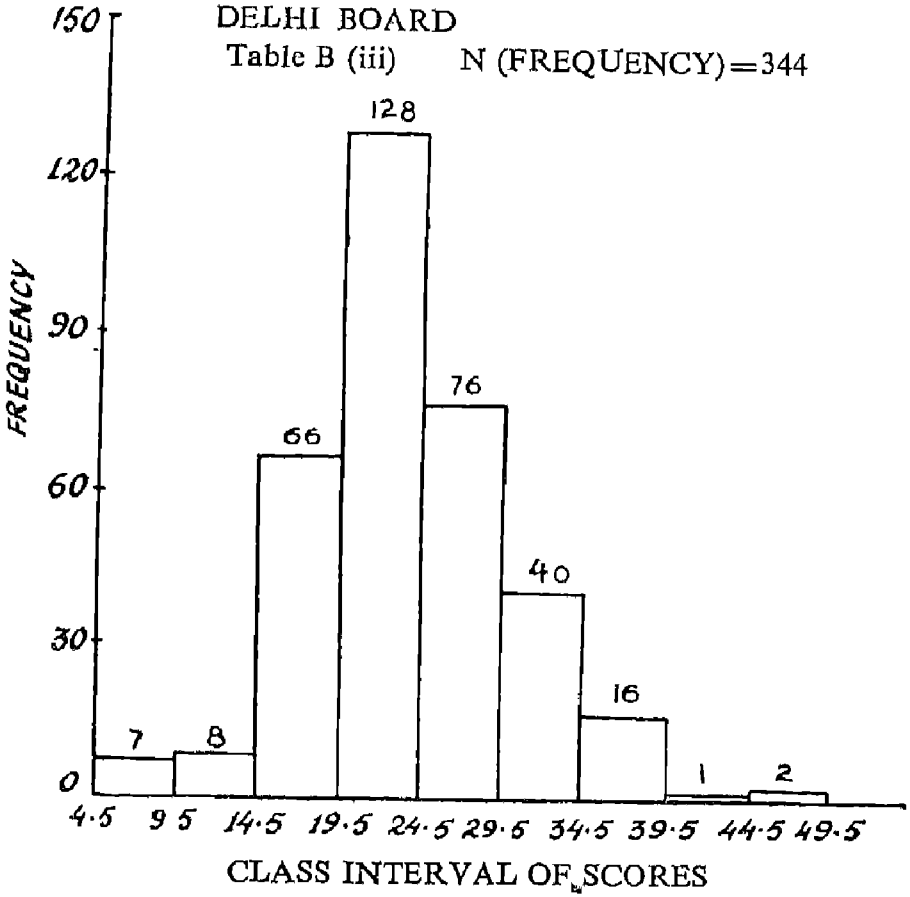
Table A(vi) N(FREQUENCY)= 883

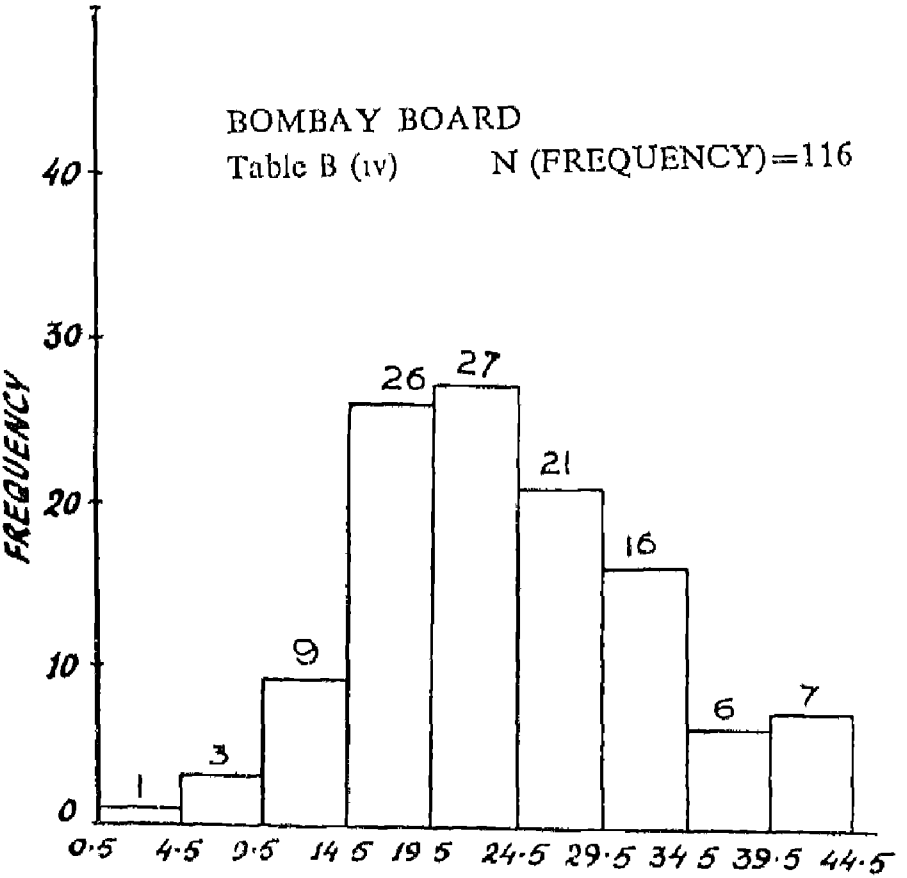


FREQUENCY DISTRIBUTION OF SCORES ON ESSAY PAPER FOR CANDIDATES INTERVIEWED AT DIFFERENT BOARDS.



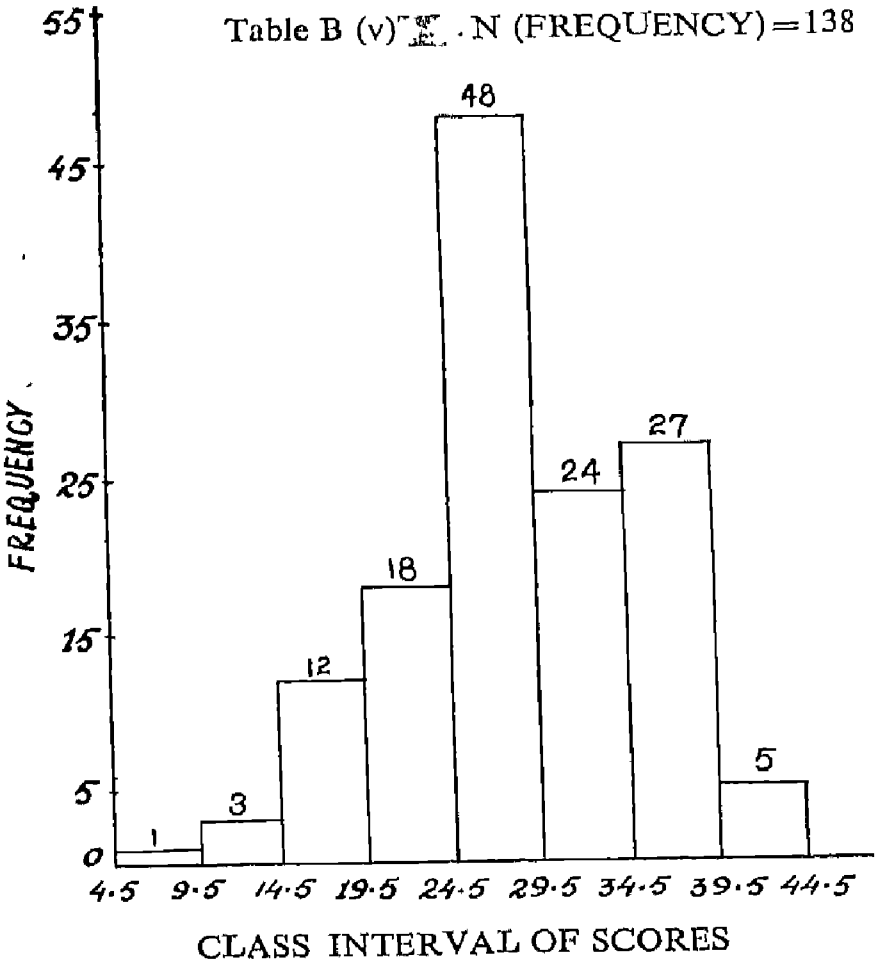

CALCUTTA BOARD
Table B (ii) N (FREQUENCY)=136
FREQUENCY
40
30
20
10
0
1
2
14
28
36
21
25
6
3
0·5
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
CLASS INTERVAL OF SCORES


DELHI BOARD
Table B (iii) N (FREQUENCY)=344
FREQUENCY
150
120
90
60
30
0
7
8
66
128
76
40
16
1
2
4·5
9 5
14·5
19·5
24·5
29·6
34·5
39·5
44·5
49·5
CLASS INTERVAL OF SCORES


BOMBAY BOARD
Table B (iv)
N (FREQUENCY)=116
FREQUENCY
40
30
20
10
0
1
3
9
26
27
21
16
6
7
0·5
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
44·5
CLASS INTERVAL OF SCORES

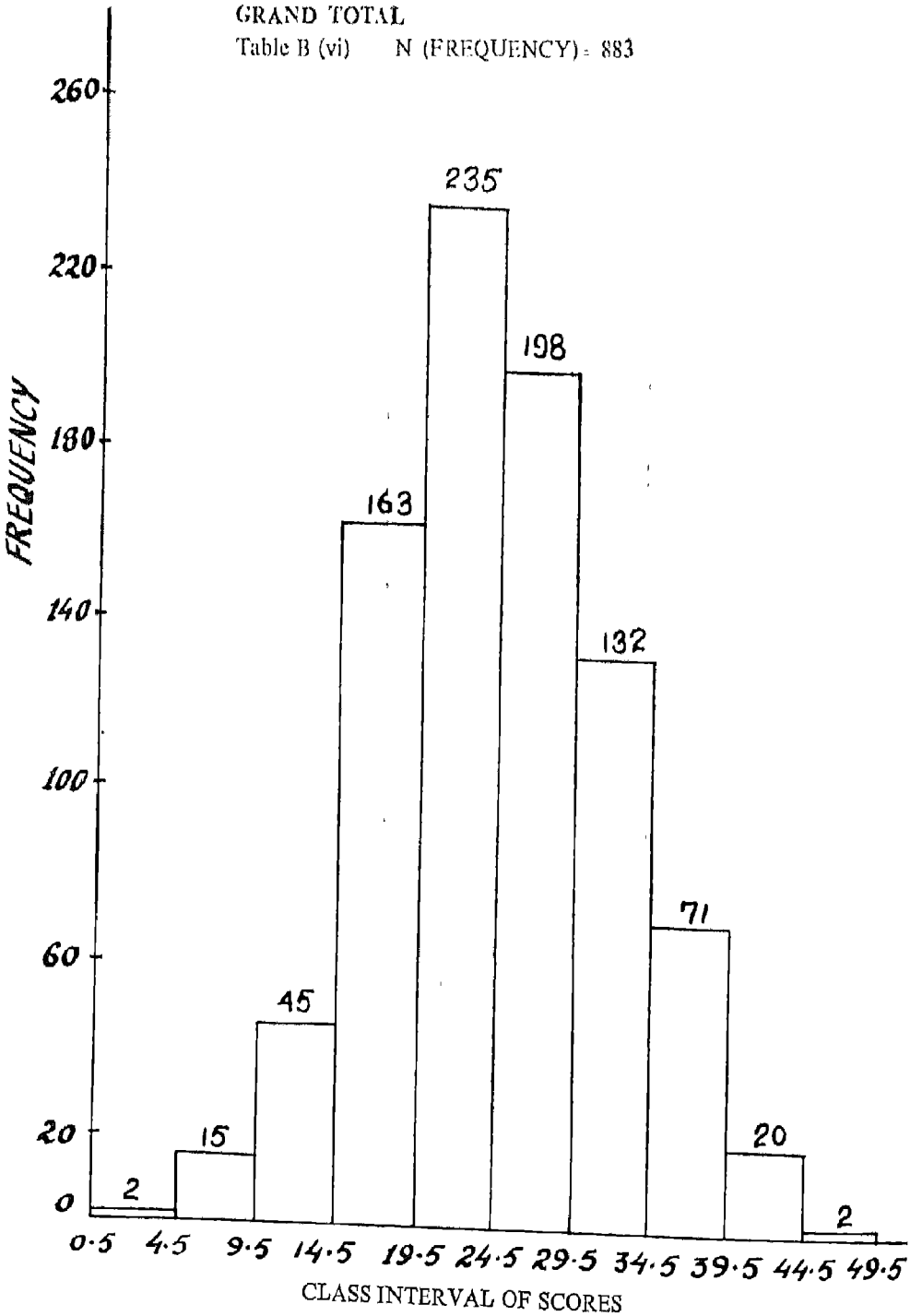
DEHRADUN BOARD

Table B (v) N (FREQUENCY) = 138

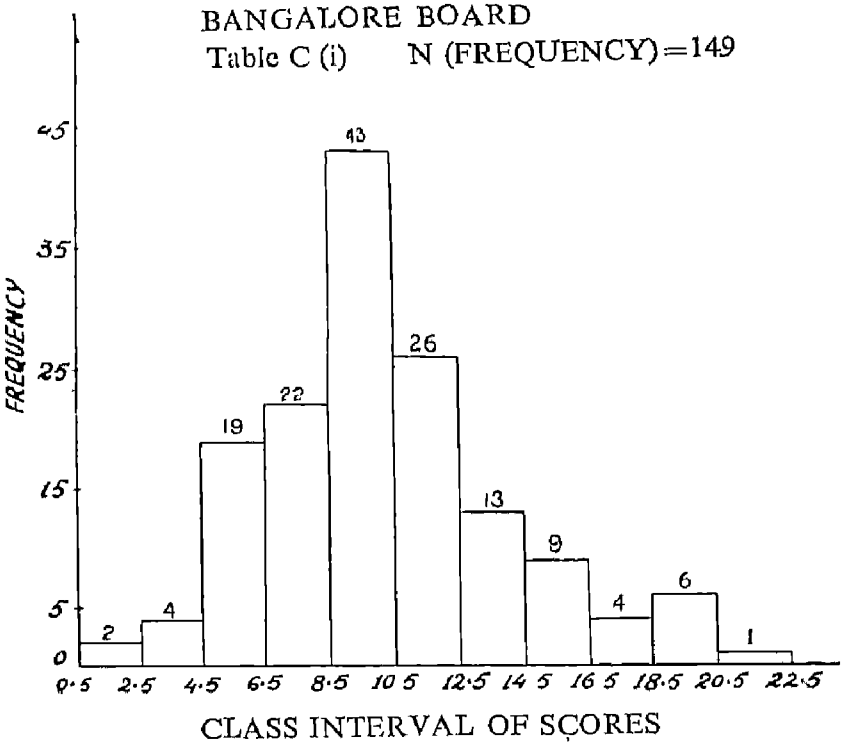


GRAND TOTAL

Table B (vi) N (FREQUENCY) = 883

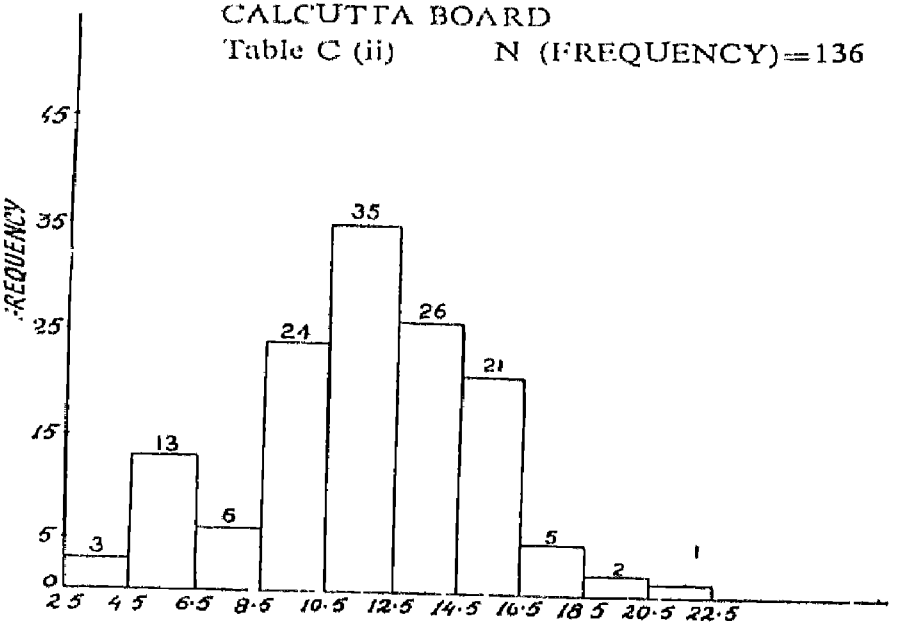


FREQUENCY DISTRIBUTION OF SCORES ON THE PROJECT REPORT FOR THE CANDIDATES INTERVIEWED AT VARIOUS BOARDS



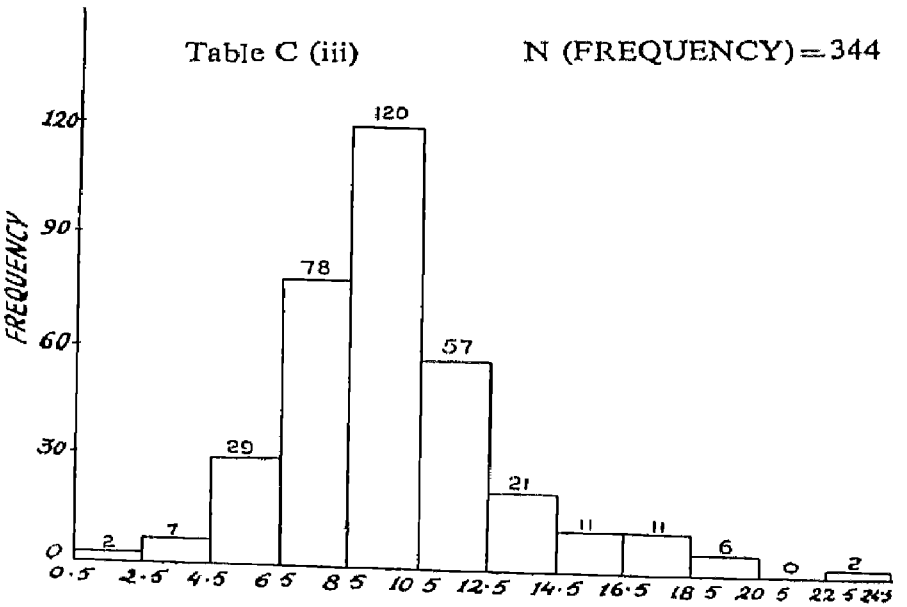
CALCUTTA BOARD

Table C (ii) N (FREQUENCY)=136



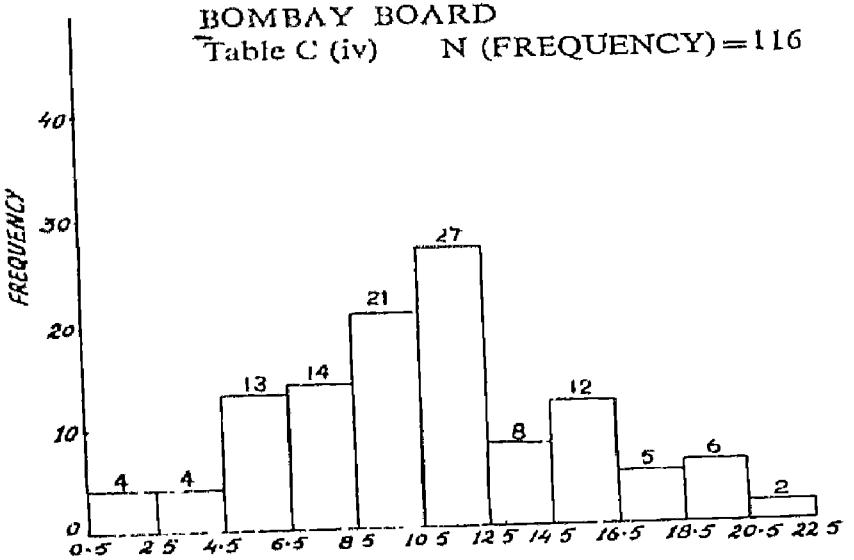
CLASS INTERVAL OF SCORES

Table C (iii) N (FREQUENCY)=344



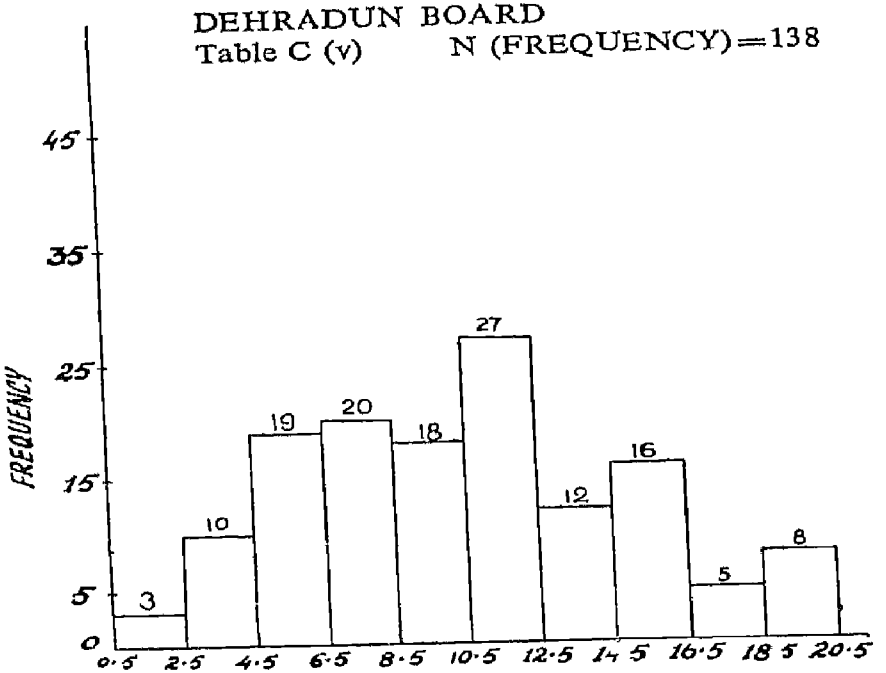
CLASS INTERVAL OF SCORES

BOMBAY BOARD
Table C (iv) N (FREQUENCY) = 116



CLASS INTERVAL OF SCORES

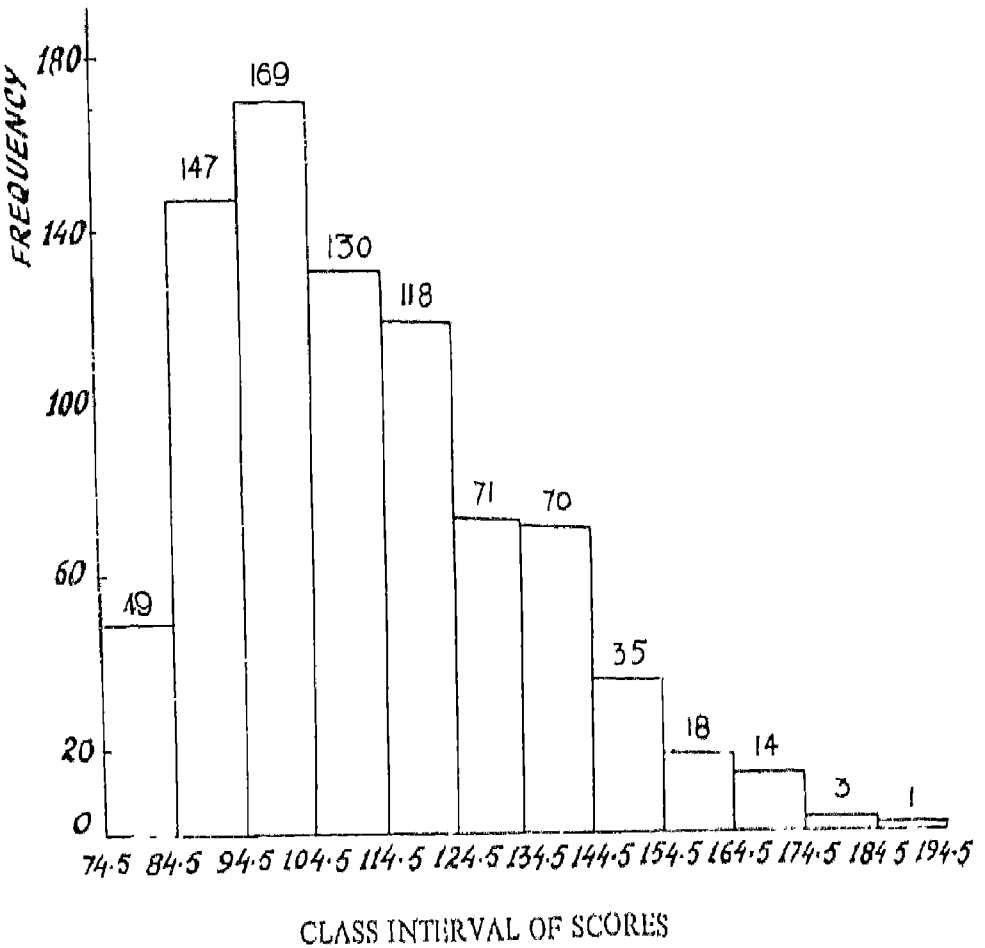
DEHRADUN BOARD
Table C (v) N (FREQUENCY) = 138



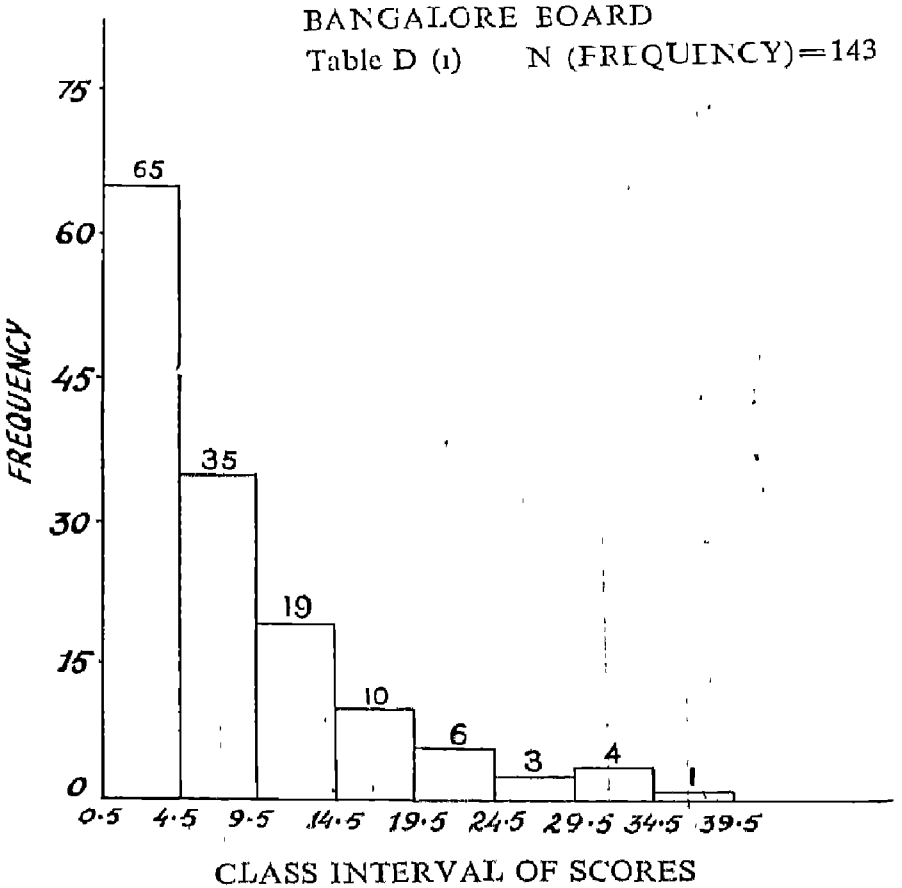
CLASS INTERVAL OF SCORES

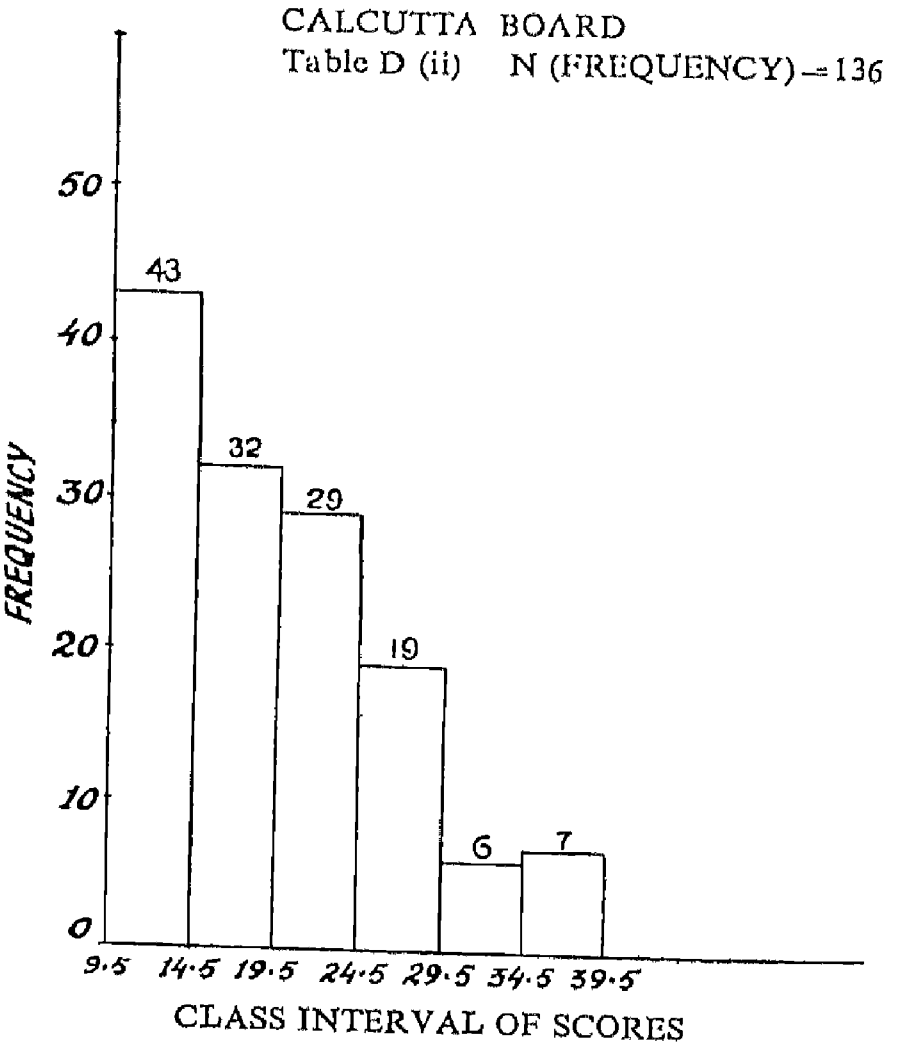
GRAND TOTAL

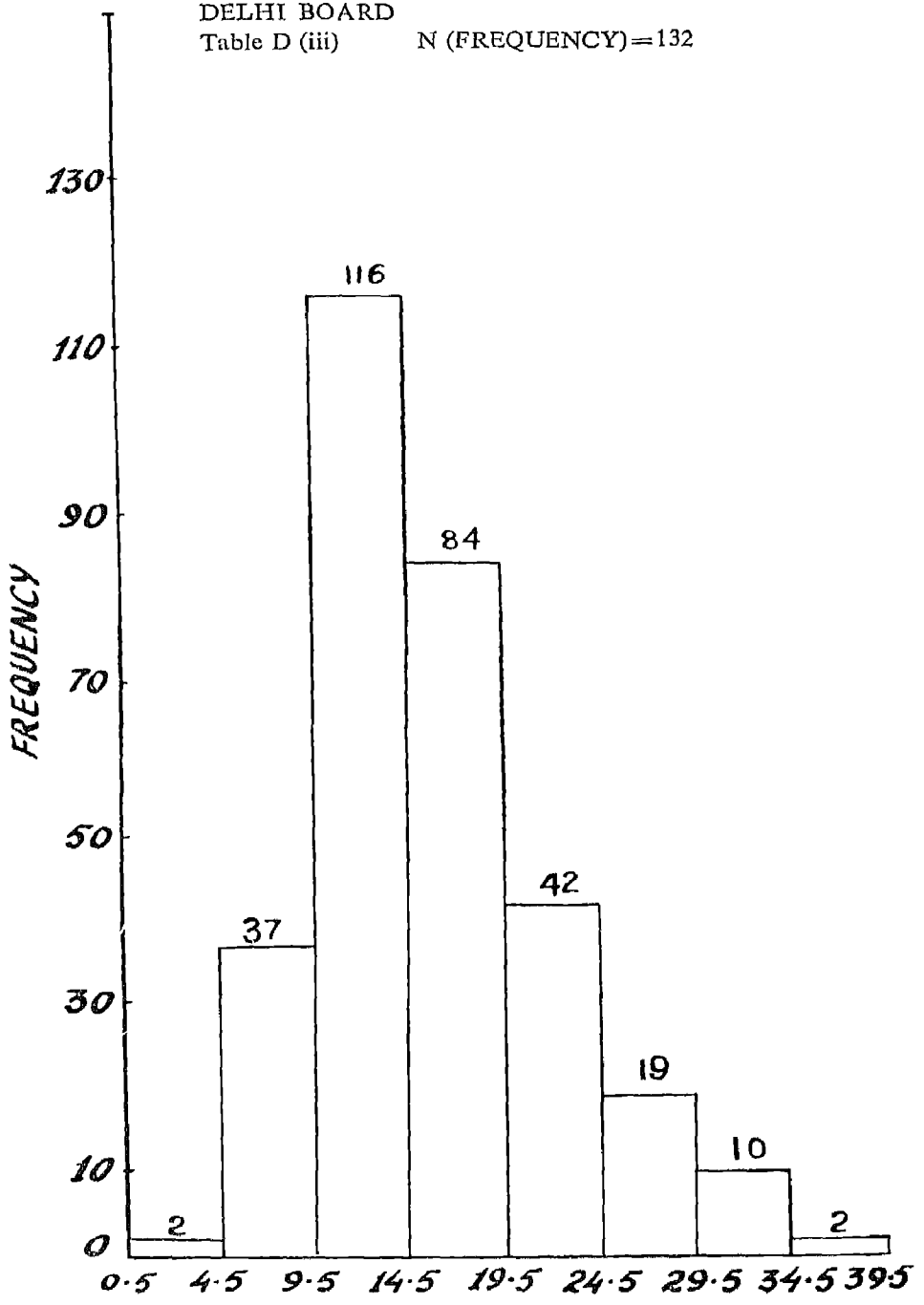
Table C(vi) N (FREQUENCY) -883

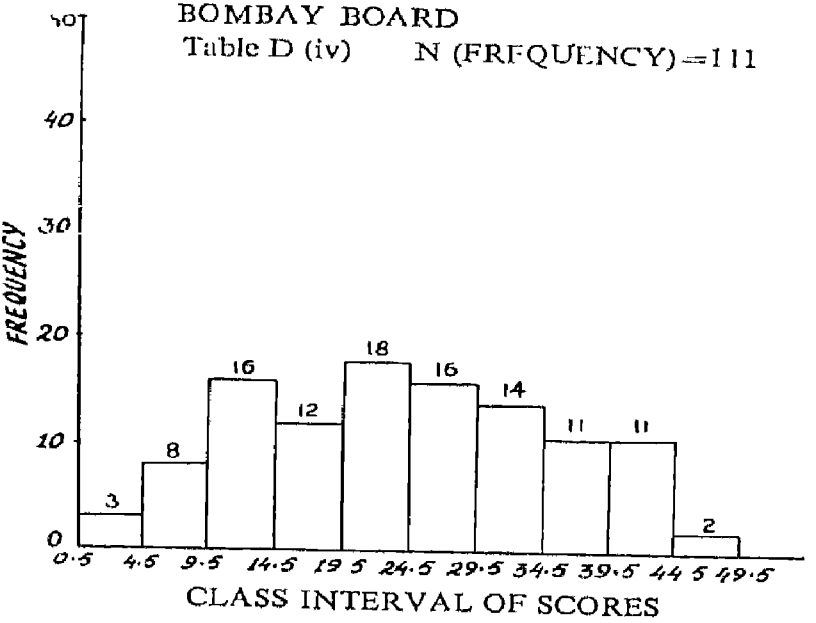


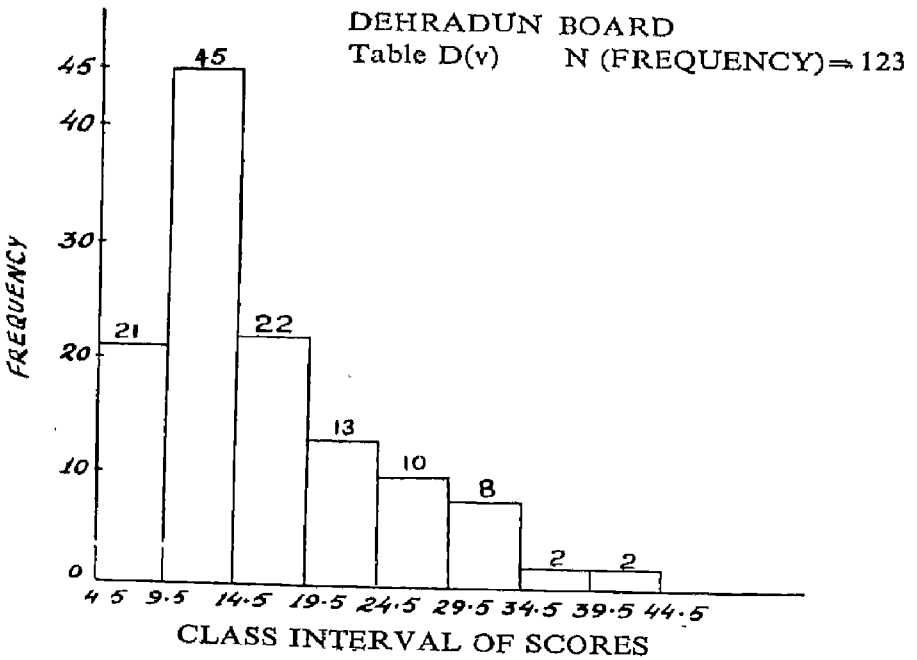
FREQUENCY DISTRIBUTION OF SCORES IN INTERVIEW PERFORMED AT DIFFERENT BOARDS

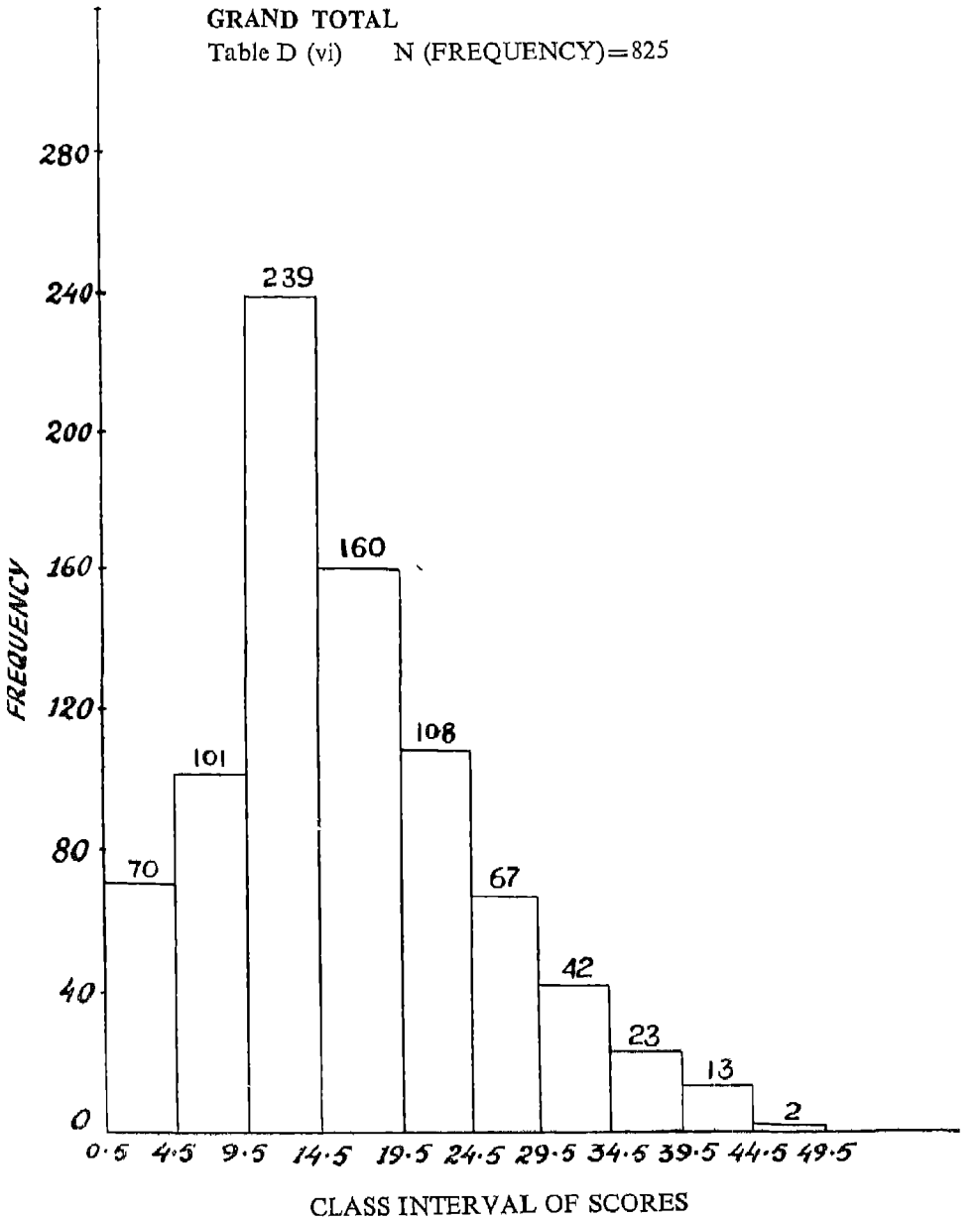



CALCUTTA BOARD
Table D (ii) N (FREQUENCY) = 136
FREQUENCY
50
40
30
20
10
0
43
32
29
19
6
7
9·5
14·5
19·5
24·5
29·5
34·5
39·5
CLASS INTERVAL OF SCORES

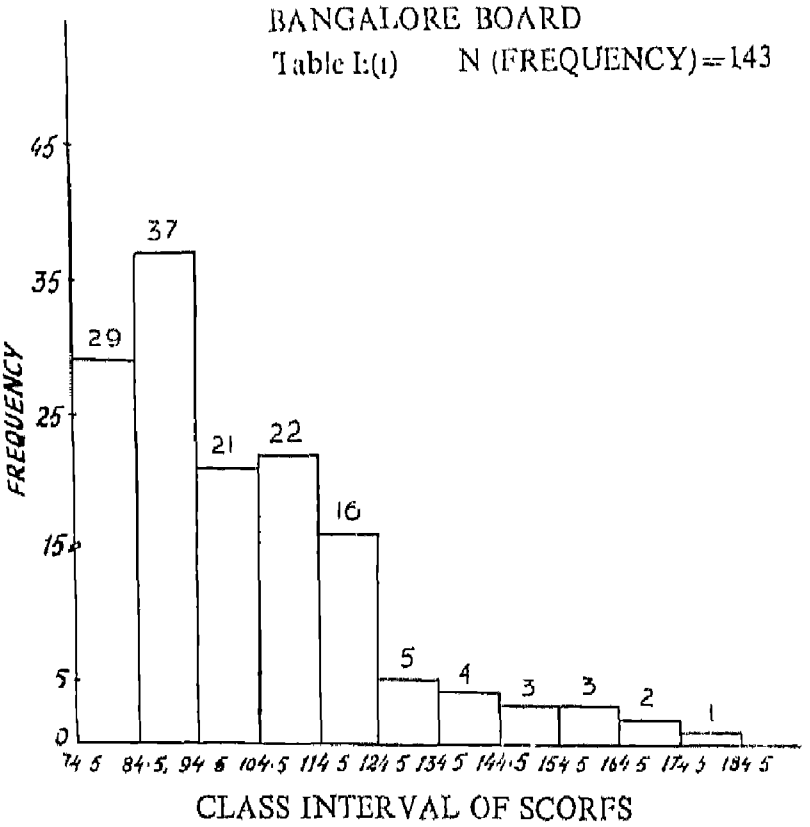

DELHI BOARD
Table D (iii)
N (FREQUENCY)=132
FREQUENCY
130
110
90
70
50
30
10
0
116
84
42
37
19
10
2
2
0·5
4·5
9·5
14·5
19·5
24·5
29·5
34·5
39·5
CLASS INTERVAL OF SCORES


BOMBAY BOARD
Table D (iv) N (FREQUENCY) = 111
FREQUENCY
0
10
20
30
40
3
8
16
12
18
16
14
11
11
2
0·5 4·5 9·5 14·5 19·5 24·5 29·5 34·5 39·5 44·5 49·5
CLASS INTERVAL OF SCORES


DEHRADUN BOARD
Table D(v) N (FREQUENCY) = 123
FREQUENCY
0
10
20
30
40
45
21
45
22
13
10
8
2
2
4·5 9·5 14·5 19·5 24·5 29·5 34·5 39·5 44·5
CLASS INTERVAL OF SCORES

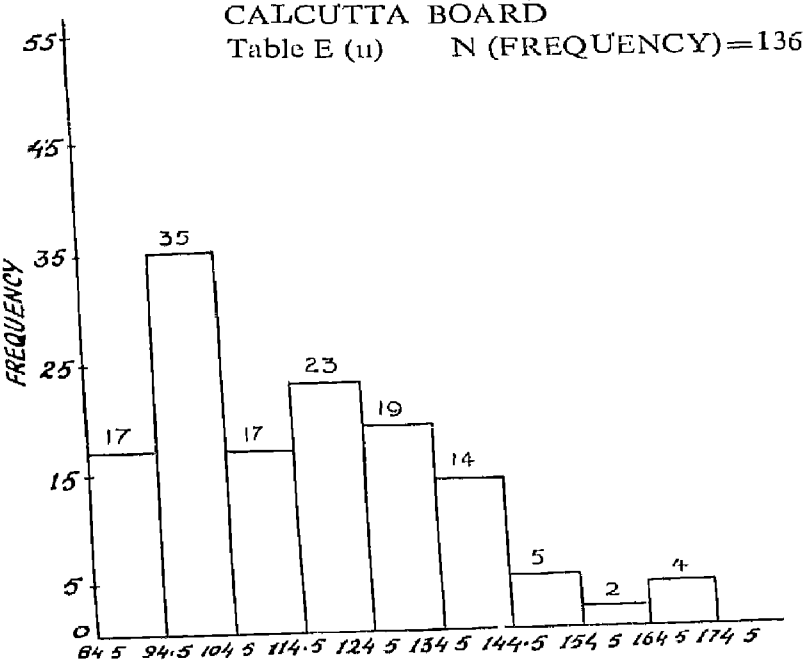

GRAND TOTAL
Table D (vi) N (FREQUENCY)=825
280
240
200
160
120
80
40
0
FREQUENCY
70
101
239
160
108
67
42
23
13
2
0·5 4·5 9·5 14·5 19·5 24·5 29·5 34·5 39·5 44·5 49·5
CLASS INTERVAL OF SCORES

FREQUENCY DISTRIBUTION OF THE SCORES OF THE WHOLE TEST FOR DIFFERENT BOARDS



CALCUTTA BOARD

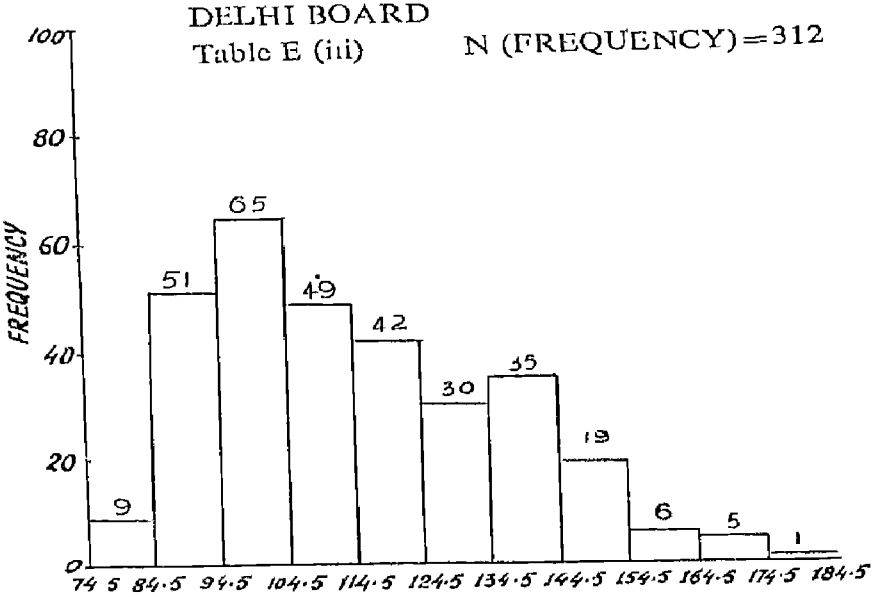
Table E (ii) N (FREQUENCY)=136



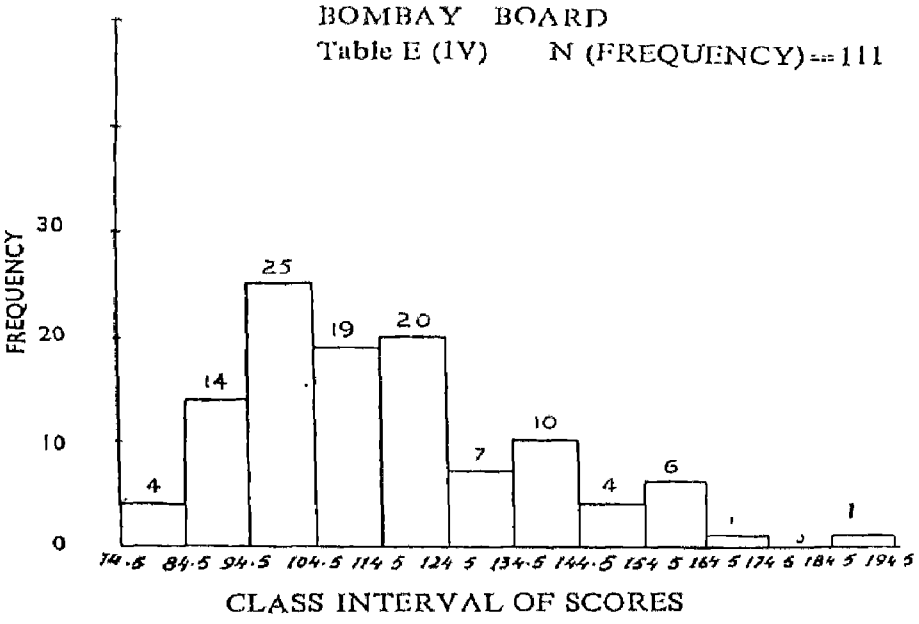
CLASS INTERVAL OF SCORES

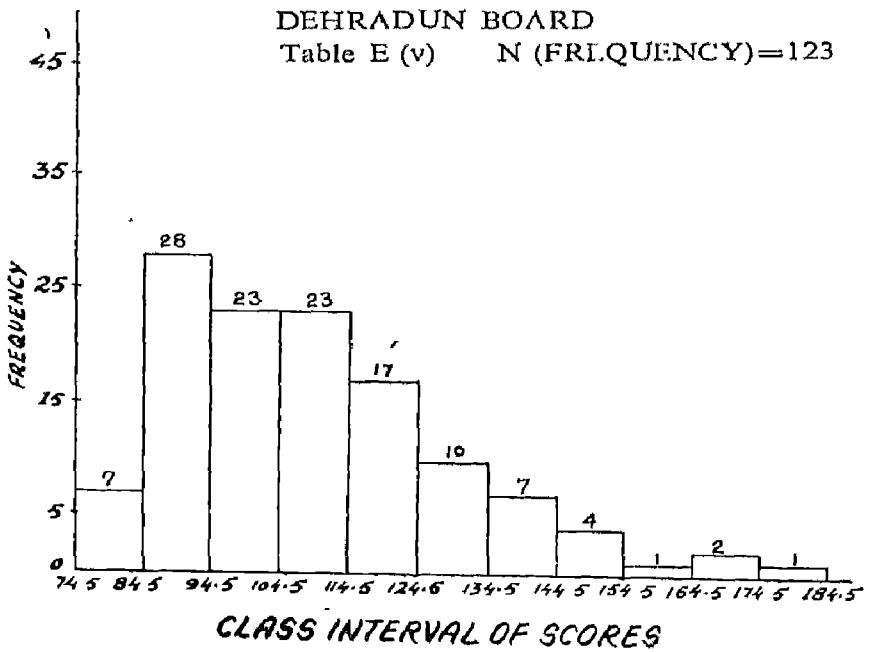
DELHI BOARD

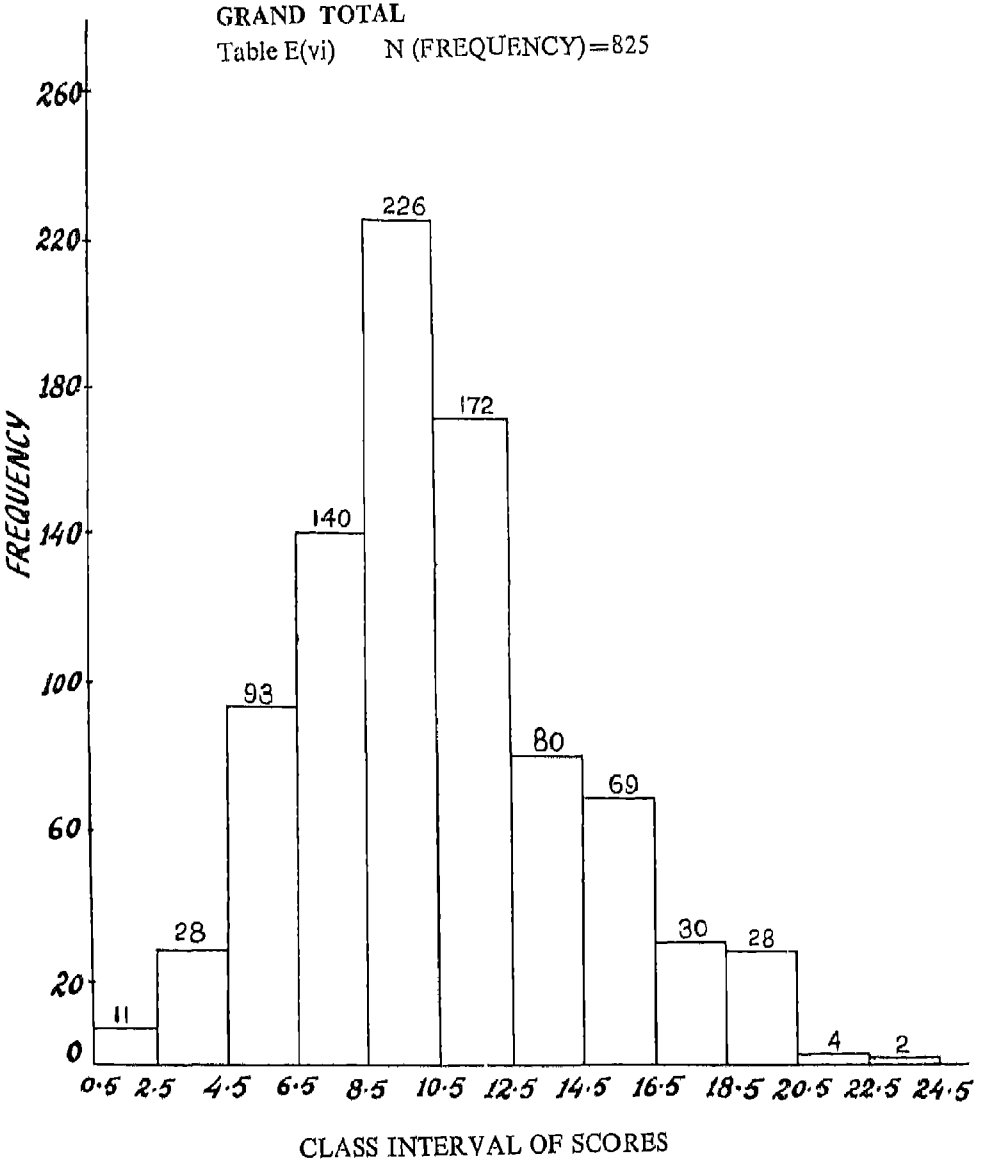
Table E (iii) N (FREQUENCY)=312



CLASS INTERVAL OF SCORES


BOMBAY BOARD
Table E (IV) N (FREQUENCY) = 111
FREQUENCY
30
20
10
0
4
14
25
19
20
7
10
4
6
1
3
1
74·5 84·5 94·5 104·5 114·5 124·5 134·5 144·5 154·5 164·5 174·5 184·5 194·5
CLASS INTERVAL OF SCORES


DEHRADUN BOARD
Table E (v) N (FRLQUENCY) = 123
FREQUENCY
45
35
25
15
5
0
7
28
23
23
17
10
7
4
1
2
1
74·5 84·5 94·5 104·5 114·5 124·5 134·5 144·5 154·5 164·5 174·5 184·5
CLASS INTERVAL OF SCORES


GRAND TOTAL
Table E(vi) N (FREQUENCY)=825
FREQUENCY
260
220
180
140
100
60
20
0
11
28
93
140
226
172
80
69
30
28
4
2
0·5 2·5 4·5 6·5 8·5 10·5 12·5 14·5 16·5 18·5 20·5 22·5 24·5
CLASS INTERVAL OF SCORES

APPENDIX XII

CORRELATIONAL FIGURES –AT A GLANCE

Table No	Specification	N	r	Significance Level
1.	S.T.S. Total Year 1964/ x Science subjects (Hr. Secondary)	200	0.37	0.05
2.	S.T.S. Total 1964 x Science subjects (B.Sc. Ist year)	160	0.36	0.05
3.	S.T.S. Total Year 1964 x Science Subjects (B.Sc. IInd year)	100	0.24	0.05
4.	S.T.S. Total Year 1964 x Physics (B.Sc. IInd year)	71	0.27	0.05
5.	S.T.S. Total Year 1964 x Chemistry (B.Sc. IInd year)	81	0.27	0.05
6.	S.T.S. Total Year 1964 x Mathematics (IInd year)	66	0.32	0.05
7.	S.A.T. year 1964 x Science subjects (Hr. Secondary)	119	0.46	0.05
8.	S.A.T. year 1964 x Science subjects (BSc. Ist year)	117	0.27	0.05
9.	S.A.T. year 1964 x Science subjects (B.Sc. IInd year)	103	0.32	0.05
10.	S.A.T. Total year 1965 x Science subjects (Hr. Secondary)	154	0.27	0.05
11.	S.T.S. year 1965 x Science subjects (Hr. Secondary)	92	0.02	not significant
12.	S.T.S. Total year 1965 x Science subjects (B.Sc. Ist year)	100	0.33	0.05
13.	S.A.T. year 1965 x Science subjects (B.Sc. Ist year)	96	0.23	0.05
14.	S.T.S. Total year 1965 x Physics (B.Sc. Ist Year)	82	0.02	not significant
15.	S.T.S. Total year 1965 x Chemistry (B.Sc. Ist year)	84	0.27	0.05
16.	S.T.S. Total year 1965 x Math. (B.Sc. Ist year)	64	0.22	not significant
17.	S.A.T. year 1965 x Physics (B.Sc. Ist year)	91	0.25	0.05
18.	S.A.T. Year 1965 x Chemistry (B.Sc. Ist year)	82	0.22	0.05
19.	S.A.T. Year 1965 x Math (B.Sc. Ist Year)	65	0.24	0.05

APPENDIX XII

Table 1

CORRELATION BETWEEN S.T S. TOTAL MARKS, % AGE OF MARKS SECURED AT THE Hr. SECONDARY EXAMINATION IN SCIENCE SUBJECTS (Viz., Physics, Chemistry, Biology and Mathematics) BY THE AWARDEES OF THE YEAR 1964

% age of Marks / S.T.S. MARKS	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	Total
125-135	—	1	3	9	12	7	7	4	2	—	—	45
135-145	3	4	1	10	8	5	8	9	3	—	—	51
145-155	1	2	3	3	6	7	4	7	5	—	—	38
155-165	—	1	2	2	—	6	4	5	1	—	—	21
165-175	—	—	1	2	—	4	2	3	1	—	—	13
175-185	—	1	—	—	2	1	3	1	2	1	—	11
185-195	—	—	—	1	2	1	1	2	1	—	1	9
195-205	—	—	—	—	1	—	1	—	1	—	2	5
205-215	—	—	—	—	—	—	—	—	—	—	2	2
215-225	—	—	—	—	—	—	—	1	—	—	1	2
225-235	—	—	—	—	—	—	—	—	1	—	—	1
235-245	—	—	—	—	—	1	—	—	1	—	—	2
Total	4	9	10	27	31	32	30	32	18	1	6	200

$r = 0.37$

Value of r is significant at 0.05 Level.

Table 2

CORRELATION BETWEEN THE S.T.S. MARKS & % AGE OF MARKS SCORED IN B.Sc. 1st. YEAR IN THE SCIENCE SUBJECTS (Viz., Physics, Chemistry, Biology & Mathematics) BY THE AWARDEES OF THE YEAR 1964

% age of Marks in B.Sc. 1st.year / S.T.S marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80 85%	85-90%	90-95%	95-100%	Total
125-135	1	4	3	12	3	5	5	2	2	—	—	—	37
135-145	3	5	7	6	8	4	2	7	1	—	—	—	43
145-155	2	—	5	3	2	3	11	1	1	—	—	—	28
155-165	1	3	1	3	2	1	3	4	—	—	—	—	18
165-175	—	—	2	—	5	1	—	2	—	—	—	—	10
175-185	—	—	—	1	—	2	1	—	2	—	—	—	6
185-195	—	—	—	—	4	1	—	2	—	—	2	—	9
195-205	—	—	—	—	1	—	—	—	2	—	—	—	3
205-215	—	—	—	—	—	—	—	—	—	—	—	1	1
215-225	—	—	—	—	—	—	1	—	2	—	—	—	3
225-235	—	—	—	—	—	—	—	—	—	—	—	—	0
235-245	—	—	—	—	—	1	1	—	—	—	—	—	2
Total	7	12	18	25	25	18	24	18	10	0	2	1	160

$r = 0.36$

Value of r is significant at 0.05 Level.

Table 3

CORRELATION BETWEEN S.T.S. TOTAL MARKS AND B.Sc. IInd YEARS MARK IN SCIENCE SUBJECTS (Viz., Physics, Chemistry, Mathematics., Biology) SCORED BY THE AWARDEES OF THE YEAR 1964

% age of marks/S.T.S. marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	Total
125-135	5	—	6	3	2	6	2	1	—	—	25
135-145	—	4	4	13	4	1	3	2	—	—	31
145-155	1	3	4	2	4	3	3	1	—	—	21
155-165	—	1	1	2	—	1	—	—	—	—	5
165-175	—	1	1	2	—	—	1	—	—	—	5
175-185	1	—	—	1	2	2	—	—	—	—	6
185-195	—	—	1	2	—	—	—	—	—	—	3
195-205	—	—	—	—	—	—	—	—	1	1	2
205-215	—	—	—	—	—	—	—	—	—	—	0
215-225	—	—	—	—	—	—	—	—	—	1	1
225 235	—	—	—	—	—	—	—	—	—	—	0
235-245	—	—	—	—	—	1	—	—	—	—	1
Total	7	9	17	25	12	14	9	4	1	2	100

$r = 0.24$

Value of r is significant at 0.05 Level.

Table 4

DEGREE OF ASSOCIATION BETWEEN S.T.S MARKS AND THE% AGE OF MARKS SCORED IN PHYSICS AT THE IInd YEAR OF THE THREE YEARS DEGREE COURSE BY THE AWARDEES OF 1964

% age of marks/ S.T S. Total	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	Total
125-135	1	2	2	2	3	2	2	1	1	—	16
135-145	1	1	3	4	2	4	3	4	1	—	23
145-155	1	1	2	2	3	3	—	—	1	—	13
155-165	—	—	1	1	2	—	—	1	—	—	5
165-175	—	—	1	2	—	—	1	—	—	—	4
175-185	—	—	1	—	—	3	—	—	—	1	5
185-195	—	—	—	—	—	—	—	—	—	1	1
195-205	—	—	—	—	—	—	—	—	1	—	1
205-215	—	—	—	—	—	—	1	—	—	—	1
215-225	—	—	—	—	—	—	1	—	—	—	1
225-235	—	—	—	—	—	—	—	—	—	—	0
235-245	—	—	—	—	—	—	1	—	—	—	1
Total	3	4	10	11	10	12	9	6	4	2	71

r=0.27

Value of r is significant at 0.05 Level.

Table 5

DEGREE OF ASSOCIATION BETWEEN S.T.S. MARKS AND THE% AGE OF MARKS SCORED IN CHEMISTRY AT THE IInd YEAR OF THE THREE YEARS DEGREE COURSE BY THE AWARDEES OF 1964

% age of Marks/ S T.S	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	Total
125-135	—	1	3	3	5	1	5	1	1	—	—	20
135-145	2	1	5	3	—	3	4	1	—	—	—	19
145-155	2	3	2	5	4	2	2	1	—	—	—	21
155-165	—	—	2	—	—	1	1	—	1	—	—	5
165-175	—	—	1	—	2	—	1	—	—	—	—	4
175-185	—	—	—	—	2	1	—	—	1	—	—	4
185-195	—	—	1	1	—	—	—	—	1	1	—	4
195-205	—	—	—	1	—	—	—	—	—	1	—	2
205-215	—	—	—	—	—	—	—	—	—	—	—	0
215-225	—	—	—	—	—	—	—	—	—	—	1	1
225-235	—	—	—	—	—	—	—	—	—	—	—	0
235-245	—	—	—	1	—	—	—	—	—	—	—	1
Total	4	5	14	14	13	8	13	3	4	2	1	81

r=0.27

Value of r is significant at 0.05 Level.

Table 6

DEGREE OF ASSOCIATION BETWEEN S.T.S. MARKS AND THE % AGE OF MARKS SCORED IN MATHEMATICS AT THE IInd YEAR DEGREE COURSE BY THE AWARDEES OF 1964

% age of Marks / S T.S. Total	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%	Total
125-135	3	1	—	2	1	2	—	1	3	—	—	—	13
135-145	2	3	—	—	—	1	5	2	4	3	—	—	20
145-155	3	2	1	3	—	1	1	—	4	—	—	—	15
155-165	—	1	1	—	—	—	—	—	1	1	—	—	4
165-175	—	—	1	—	—	—	—	—	—	—	—	—	1
175-185	—	—	—	2	—	—	—	—	—	—	1	—	3
185-195	—	—	—	—	2	—	—	1	1	1	—	—	5
195-205	—	—	—	—	—	—	—	—	1	—	—	1	2
205-215	—	—	—	—	—	—	—	—	—	—	1	—	1
215-225	—	—	—	—	—	—	—	—	1	1	—	—	2
Total	8	7	3	7	3	4	6	4	15	6	2	1	66

r=0.32

The value of r is significant at 0.05 Level.

Table 7

DEGREE OF ASSOCIATION BETWEEN THE MARKS SCORED IN S.A.T. OF THE YEAR 1964 AND THE% AGE OF MARKS SCORED IN SCIENCE SUBJECTS (Viz, PHYSICS, CHEMISTRY, BIOLOGY AND MATHEMATICS) AT HIGHER SECONDARY EXAMINATION BY THE AWARDEES OF 1964.

% age of Marks / Marks in S.A.T.	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	Total
40-50	2	1	1	3	1	4	—	—	—	12
50-60	3	2	5	1	4	9	1	3	1	29
60-70	—	3	3	4	3	3	2	—	—	18
70-80	—	—	2	3	2	1	3	1	2	14
80-90	—	—	2	4	4	2	3	4	—	19
90-100	—	—	2	2	4	1	4	1	2	16
100-110	—	—	—	—	—	1	1	2	2	6
110-120	—	—	—	—	—	—	—	—	3	3
120-130	—	—	—	—	—	—	1	—	—	1
130-140	—	—	—	—	—	—	—	—	1	1
Total	5	6	15	17	18	21	15	11	11	119

r=0.46

Value of r is significant at 0.05 level.

Table 8

DEGREE OF ASSOCIATION BETWEEN THE MARKS SECURED IN S.A.T. OF THE YEAR 1964 ANA THE % AGE OF MARKS SECURED IN SCIENCE SUBJECT (VIZ., PHYSICS, CHEMISTRY, BIOLOGY AND MATHEMATICS) AT B.Sc. Ist YEAR BY THE AWARDEES OF 1964.

% Age of marks/ Marks in S.A.T.	45–50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90–95%	Total
40-50	—	—	3	4	2	1	2	—	—	—	12
50-60	1	1	2	1	6	6	4	2	—	—	23
60-70	2	1	3	1	2	2	5	—	—	—	16
70-80	2	4	1	1	2	4	—	—	—	—	14
80-90	—	4	5	5	1	3	1	2	2	—	23
90–100	—	1	2	3	2	1	3	—	3	2	17
100-110	—	—	—	1	—	1	1	1	—	—	4
110-120	—	—	—	1	—	—	—	1	2	1	5
120–130	—	—	—	—	1	1	—	—	—	—	2
130-140	—	—	—	—	—	—	—	1	—	—	1
Total	5	11	16	17	16	19	16	7	7	3	117

r = 0.24

Value of r is significant at 0.05 Level.

Table 9

DEGREE OF ASSOCIATION BETWEEN THE MARKS SECURED IN S.A.T. OF THE YEAR 1964 AND THE % AGE OF MARKS SECURED IN SCIENCE SUBJECT (Viz. PHY , CHEM , BIOLOGY AND MATHEMATICS) AT B Sc. IIND YEAR BY THE AWARDEES OF 1964

% Age of Marks/ Marks in S.A.T.	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	Total
40-50	1	—	2	4	2	1	1	—	—	—	11
50-60	1	2	1	8	1	3	5	—	—	2	23
60-70	1	—	6	2	1	3	1	—	1	—	15
70-80	2	1	4	1	4	2	1	—	—	—	15
80-90	—	3	1	4	4	3	2	2	—	—	19
90-100	—	—	2	5	1	2	—	2	1	—	13
100-110	—	—	—	—	—	—	—	1	2	—	3
110-120	—	—	—	—	—	—	—	—	—	1	1
120-130	—	—	—	—	—	1	—	—	—	1	2
130-140	—	—	—	—	—	—	—	—	—	1	1
Total	5	6	16	24	13	15	10	5	4	5	103

r=0.32

Value of r is significant at 0.05 Level.

Table 10

CORRELATION BETWEEN THE S T S. TOTAL MARKS AND % AGE OF THE MARKS SECURED AT THE HR SECONDARY EXAMINATION IN SCIENCE SUBJECTS (VIZ., PHY., CHEM., MATH AND BIOLOGY) BY THE AWARDEES OF 1965

% age of marks/ S.T.S. marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	Total
120-130	1	—	—	1	7	10	6	5	4	3	—	37
130-140	1	—	2	5	8	3	5	5	4	3	—	36
140-150	—	—	2	—	3	8	2	1	5	3	—	24
150-160	—	—	2	2	3	4	2	7	5	—	1	26
160-170	—	—	1	—	—	1	2	2	3	—	1	10
170-180	—	—	—	—	—	—	—	2	3	—	—	5
180-190	—	—	—	1	—	1	1	1	—	2	1	7
190-200	—	—	—	—	—	—	1	2	4	—	—	7
200-210	—	—	—	—	—	—	1	—	—	—	—	1
210-220	—	—	—	—	—	—	—	—	—	—	—	0
220-230	—	—	—	—	—	—	—	—	1	—	—	1
Total	2	—	7	9	21	27	20	25	29	11	3	154

$r = 0.27$

Value of r is significant at 0.05 Level

Table 11

DEGREE OF ASSOCIATION BETWEEN THE SCIENCE APTITUDE TEST AND THE MARKS SECURED AT THE Hr. SECONDARY EXAMINATION BY THE AWARDEES OF YEAR 1965

% age of marks/ S.A.T. Marks	40–45%	45-50%	50-55%	55-60%	60–65%	65–70%	70-75%	75-80%	80-85%	85-90%	90–95%	Total
45-55	—	—	—	—	1	5	2	—	—	—	—	8
55-65	—	—	—	—	1	3	—	5	—	—	—	9
65-75	1	—	—	1	2	5	3	2	3	2	—	19
75-85	—	—	—	3	4	6	2	3	5	3	—	26
85-95	—	—	2	1	1	5	—	2	1	1	1	14
95-105	—	—	1	—	1	—	5	—	3	—	1	11
105-115	—	—	—	—	—	—	—	1	—	1	—	2
115-125	—	—	—	—	—	—	—	1	1	—	—	2
125-135	—	—	—	—	—	—	—	—	1	—	—	1
Total	1	—	3	5	10	24	12	14	14	7	2	92

r=0.2

Value of r is not significant at 0.05 Level

Table 12

CORRELATION BETWEEN S.T S. TOTAL MARKS AND % AGE OF MARKS SECURED AT THE B.SC. IST YEAR IN SCIENCE SUBJECTS (Viz., PHY., CHEM., MATH. AND BIOLOGY) BY THE AWARDEES OF THE YEAR 1965

% age of marks/ S.T.S. Marks	40–45%	55-50%	50-55%	55-60%	60–65%	65-70%	70-75%	75-80%	80-85%	85–90%	90-95%	Total
120-130	6	1	—	4	2	5	5	2	—	—	—	25
130-140	2	2	4	5	5	4	3	3	—	—	—	28
140-150	—	—	2	3	6	4	1	1	—	—	—	17
150-160	—	2	1	2	—	6	2	2	—	—	—	15
160-170	—	—	1	2	—	—	—	—	—	—	—	3
170-180	—	—	—	1	1	1	—	—	—	—	—	3
180-190	—	—	—	—	1	—	—	1	1	—	1	4
190-200	—	—	—	—	—	—	2	—	1	—	—	3
200-210	—	—	—	—	—	1	—	—	—	—	—	1
210-220	—	—	—	—	—	—	—	—	—	—	—	0
220-230	—	—	—	—	—	—	—	1	—	—	—	1
Total	8	5	8	17	15	21	13	10	2	—	1	100

r=0.33

Value of r is significant at 0.05 Level

Table 13

DEGREE OF ASSOCIATION BETWEEN THE SCIENCE APTITUDE TEST MARKS AND % AGE OF MARKS IN SCIENCE SUBJECTS VIZ., (PHY., CHEM., MATH. AND BIOLOGY) SECURED AT THE IST YEAR OF THE THREE YEAR DEGREE COURSE BY THE AWARDEES OF YEAR 1965.

% age of marks/ S.T.S. Marks	40–45%	45–50%	50–55%	55-60%	60-65%	65–70%	70–75%	75-80%	80–85%	85-90%	90-95%	Total
45-55	—	—	2	3	1	—	1	3	—	—	—	10
55-65	—	—	—	2	2	5	3	—	—	—	—	12
65-75	3	1	3	—	2	3	3	4	—	—	—	19
75-85	3	1	—	7	6	5	1	2	—	—	—	25
85-95	—	1	1	2	5	1	1	—	1	—	1	13
95-105	—	—	2	2	—	2	3	2	—	—	—	11
105-115	—	—	—	—	—	—	2	—	—	—	—	2
115-125	—	—	—	—	—	—	—	—	1	1	—	2
125-135	—	—	—	—	—	—	—	1	—	1	—	2
Total	6	3	8	16	16	16	14	12	2	2	1	96

r=0.23

Value of r is significant at 0.05 Level

TABLE 14

CORRELATION BETWEEN S.T.S. TOTAL MARKS AND B.Sc. Ist YEAR MARKS (PHYSICS) SCORED BY THE AWARDEES OF THE YEAR 1965

B.Sc. Ist year/ S.T.S. marks	35-40%	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85 90%	90-95%
120-130	—	2	2	—	2	2	4	4	5	—	—	—
130-140	1	1	3	2	5	1	4	3	1	—	—	—
140-150	—	1	1	—	3	3	2	4	—	—	—	—
150-160	—	2	—	—	3	3	1	2	2	—	—	—
160-170	—	—	—	—	—	1	1	—	1	—	—	—
170-180	—	—	—	—	—	2	1	—	—	—	—	—
180-190	—	—	—	—	—	—	1	1	—	1	—	1
190-200	—	—	—	1	—	—	—	1	—	—	—	—
200-210	—	—	—	—	—	—	—	—	—	—	—	—
210-220	—	—	—	—	—	—	—	—	—	—	—	—
220-230	—	—	—	—	—	—	—	1	—	—	—	—
Total	1	6	6	3	13	12	14	16	9	1	—	1

r=0,2 N=82

Value of r is not significant at .05 Level.

Table 15

DEGREE OF ASSOCIATION BETWEEN S.T S. TOTAL AND THE MARKS SCORED IN B.Sc Ist. YEAR IN CHEMISTRY BY THE AWARDEES OF 1965

% age of marks/ S.T S. marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	Total
120-130	5	—	2	1	1	4	3	5	—	1	—	22
130-140	2	—	—	4	3	5	2	4	—	—	—	20
140-150	1	—	3	1	3	3	2	2	—	—	—	15
150-160	2	1	2	1	1	1	2	3	—	—	—	13
160-170	—	—	1	1	—	1	—	—	—	—	—	3
170-180	—	—	—	1	2	—	—	—	—	—	—	3
180-190	—	—	—	—	—	1	—	—	1	1	—	3
190-200	—	—	—	—	—	—	1	1	—	—	—	2
200-210	—	—	—	—	—	—	—	—	—	—	1	1
210-220	—	—	—	—	—	—	—	—	1	—	—	1
220-230	—	—	—	—	—	—	—	1	—	—	—	1
Total	10	1	8	9	10	15	10	16	2	2	1	84

r=0 27

Value of r is significant at 0.05 Level

Table 16

CORRELATION BETWEEN S.T S. TOTAL MARKS AND Ist. YEAR MARK (MATHEMATICS) SCORED BY THE AWARDEES OF THE YEAR 1965

B.Sc. Ist Year/ S.T S. marks	35–40%	40–45%	45–50%	50–55%	55–60%	60–65%	65–70%	70–75%	75–80%	80–85%	85–90%
120-130	2	2	2	2	1	1	1	3	4	—	—
130-140	1	2	1	1	1	—	2	3	1	—	—
140–150	1	2	—	1	—	2	1	1	2	—	—
150-160	—	3	1	—	1	2	1	2	1	—	—
160-170	—	1	—	—	—	1	—	—	1	—	—
170-180	—	1	—	—	1	1	1	—	—	—	—
180-190	—	1	—	—	—	—	—	1	1	1	—
190-200	—	—	—	—	—	—	—	1	—	—	—
200-210	—	—	—	—	—	—	—	—	—	—	—
210-220	—	—	—	—	—	—	—	—	—	—	—
220-230	—	—	—	—	—	—	—	—	—	—	1
Total	4	12	4	4	4	7	6	11	10	1	1

r= .22 N=64

The value of r is not significant at .05 Level.

Table 17

DEGREE OF ASSOCIATION BETWEEN THE MARKS SCORED BY THE AWARDEES OF YEAR 1965 IN SCIENCE APTITUE TEST AND %AGE OF MARKS SCORED IN FHYSICS AT THE Ist YEAR OF THE THREE YEAR'S DEGREE COURSE.

% of marks/ Marks in S.A.T.	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95	Total
35-45	—	—	—	—	1	—	—	—	—	—	—	1
45-55	—	1	1	2	—	3	—	1	—	—	—	8
55-65	—	1	1	1	—	2	5	1	—	—	—	11
65-75	1	3	—	1	1	3	2	3	3	—	—	17
75-85	2	2	—	7	5	1	3	2	1	1	—	24
85-95	—	—	—	1	2	1	3	—	1	—	1	9
95-105	—	1	1	1	3	3	—	1	—	—	—	10
105-115	—	—	—	—	1	1	1	—	1	1	—	5
115-125	—	—	—	—	—	—	—	—	—	2	1	3
125-135	—	—	1	—	—	—	1	—	—	1	—	3
Total	3	8	4	13	13	14	15	8	6	5	2	91

r=0.25

Value of r is significant at 0 05 Level.

Table 18

DEGREE OF ASSOCIATION BETWEEN THE MARKS SECURED BY THE AWARDEES OF YEAR 1965 IN SCIENCE APTITUDE TEST AND % AGE OF MARKS SECURED IN CHEMISTRY AT THE IST YEAR OF THE THREE YEAR'S DEGREE COURSE

% age of marks/ Marks in S.A.T	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	Total
35-45	—	—	—	—	—	—	1	—	—	—	—	1
45-55	2	—	—	2	1	1	1	—	—	—	—	7
55-65	—	—	1	—	1	4	2	2	—	—	—	10
65-75	2	—	3	1	1	4	2	5	—	—	1	19
75-85	2	—	2	4	3	3	—	4	—	1	—	19
85-95	—	—	1	1	3	2	1	—	—	1	—	9
95-105	—	—	2	1	1	—	2	2	1	—	—	9
105-115	—	—	—	—	—	1	1	1	1	—	—	4
115-125	—	—	—	—	—	—	—	1	1	1	—	3
125-135	—	—	—	—	—	—	—	1	—	—	—	1
Total	6	—	9	9	10	15	10	16	3	3	1	82

r=0.22

Value of r is significant at 0.05 Level.

Table 19

DEGREE OF ASSOCIATION BETWEEN THE MARKS SCORED BY THE AWARDEES OF YEAR 1966 IN SCIENCE APTITUDE TEST AND % AGE OF MARKS SECURED IN MATHEMATICS AT THE IST YEAR OF THE THREE YEARS DEGREE COURSE.

% age of marks/ Marks in S.A.T.	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%	Total
35-45	—	1	—	1	—	—	—	—	—	—	—	—	2
45-55	1	—	1	—	1	3	2	1	1	—	—	—	10
55-65	—	—	2	—	2	1	2	—	—	—	2	—	9
65-75	2	—	—	—	—	—	1	5	—	—	1	—	9
75-85	1	2	1	1	—	2	3	3	—	—	—	1	14
85-95	2	1	1	—	—	1	2	—	1	—	—	—	8
95-105	—	—	—	1	1	1	1	1	1	1	—	—	7
105-115	—	—	—	—	—	—	2	1	—	—	—	—	3
115-125	—	—	—	—	—	—	—	—	—	1	—	1	2
125-135	—	—	—	—	—	—	—	—	—	1	—	—	1
Total	6	4	5	3	4	8	13	11	3	3	3	2	65

$r=0.24$

Value of r is significant at 0.05 Level

APPENDIX XIII

NEEDED RESEARCH

1. A factorial analysis of the subtests of the Science Aptitude Test may be done to ascertain the latent structure of the different areas and the abilities called into play to respond correctly to subtests.

2. A factorial analysis of the inter correlations of the four tools of selection i.e. Science Aptitude Test, Essay, Interview and Project Report may also be worked out to see the degree of overlap between the various tests of selection.

3. To study and compare the success ratio amongst those who have secured less than the cut off point viz 55% at the Higher School or equivalent examination and above the cut off point in order to judge the suitability of fixing the cut of point such that the chances of a talent being lost, on account of this arbitrary hurdle, does not exceed a pre-assigned small quantity.

4 A follow-up study of awardees to establish predictive validity in respect of different subjects, e.g. Physics, Chemistry, Mathematics and Biology and overall success at the university level.

5. A study of the nonacademic correlates of success like socio-economic conditions, education of parents, scientific environment at home, institutional variables e.g. laboratory equipment and library facilities, academic background of teachers, traditions and goals of the institution, level of expectation of the parents from their children and the achievement—motivation among the children, individually and in the peer group

6. To compare the performance of the awardees (who have opted for an engineering course) on an engineering aptitude test as against that on the Science Aptitude Test to find out whether the fall-outs from basic science courses have done so because of their inherent aptitude for engineering or due to other reasons.

7. A factorial analysis of the Science Aptitude Test alongwith other standardised tests of intelligence, Aptitude and Achievement to ascertain the factorial content of the Science Aptitude Test.

8. A comparative study of the Science Talent search tools of India as against those of other countries like the ones used at the Westing House, U.S.A., National merit sholarship scheme, U.S.A , Jagdis Bose Science Talent Search, West Bangal; Scientific Olympics, Russia, Hungary and Poland; the citizens Public Halls of Japan and Educational Testing Service, Princeton U.S A etc. with a view to analyse the content, mode of selection, tools utilised, reliability, validity and usuability

9. To compare the administrative aspects of the scheme with those of parallel schemes in other countries to study the decentralisation of the procedure of selection for efficiency and uniformity The role of good publicity in drawing talents to take the examination.

10. To study the attitude of students towards basic science, engineering and medical courses.

11. To study the evaluative aspects of the tools of selection as judged by the examinees, the teachers, the scientists and the administrators.

12. To study the personality structure of the high achievers as against a control group of low achievers.

13. To study the difference in performance of a group of awardees on an accelerated and intensive syllabus and course of study as against a control group taught under the traditional syllabus and system of teaching.

14. A study of reliability in the marking system of the same scripts of the essay paper by a set of independent examiners.

15. To study the sampling fluctuations of the reliability coefficient of the Science Aptitude Test on account of sampling of items from the possible domain of items.

16. To study the level of aspirations of the awardees as distinct from a control group of non-awardees with a view to determine the role played by such psychological variables in determining individual success.

17. To study :—

(i) The role played by institutional variables in promoting scientific creativity amongst awardees.

(ii) The role played by scientific olympics in promoting the talents by evoking a healthy competitive spirit for excellence in cognitive domain.

18. A study to check the attractiveness of the various distractors of the multiple choice question set in the compulsory as well as optional parts of the Science Aptitude Test.

19. To study whether the four optional parts (viz. Physics, Chemistry, Mathematics Biology) of the Science Aptitude Test are equally difficult in respect of Test Scores (i.e. are they parallel test).

20. Justification regarding the application of the guessing factor formula $= R - \frac{W}{n-1}$

In addition to these 20 problems for investigations, one could easily enumerate more problems for investigation.

APPENDIX XIV

EM-ANALYSIS DATA FOR THE DISCRIMINATIVE AND DIFFICULTY ES OF ITEMS OF SCIENCE APTITUDE TEST (COMPULSORY PART)

ize for top group =108
ize for bottom group=108

Correct items (top group)	Correct items (Bottom group)	Discrimi-native value of each item	Difficulty value of each item	Remarks	
62	31	18	46	Physics	Selected
99	39	44	59	-do-	-do-
62	21	25	43	-do-	-do-
69	16	35	43	-do-	-do-
79	13	45	44	-do-	-do-
101	44	45	60	-do-	-do-
82	48	20	55	-do-	-do-
34	23	8	36.5	Chemistry	Rejected
38	28	6	40	-do-	-do-
67	27	25	46.5	-do-	Selected
65	21	27	44	-do-	-do-
48	40	5	45	-do-	Rejected
105	60	42	67	-do-	Selected
43	18	18.5	37	-do-	-do-
26	25	1	35	Biology	Rejected
83	34	30	52	-do-	Selected
85	24	38	50	-do-	-do-
46	22	16	39.5	-do-	-do-
44	29	10	41	-do-	Rejected
13	21	—	—	-do-	-do-
87	19	45	49	-do-	Selected
90	34	35	54	-do-	-do-
94	37	37.5	56.2	-do-	-do-
100	55	35	62.8	Maths	-do-
55	25	18	43	-do-	-do-
41	19	16	37	-do-	-do-
69	25	23	41	-do-	-do-
88	17	47.5	49	-do-	-do-
92	27	43	53	-do-	-do-
82	23	37	49	-do-	-do-
42	25	10	39	Astronomy	Rejected
93	24	47	53	-do-	Selected
53	30	14	43.5	-do-	Rejected
44	21	16	39	-do-	Selected

35.	47	29	11.5	41.5	-do-	Rejected
36.	42	21	19	40	Physiology & Hygiene	Selected
37.	60	14	48	46.5	-do-	-do-
38.	99	40	43.5	59	-do-	-do-
39.	63	14	26.5	43	do	-do-
40.	98	15	58	52	-do-	-do-
41.	93	35	38	55	Bio-Chemistry	-do-
42.	93	34	39	55	do	-do-
43.	60	14	33	42	-do-	-do-
44.	70	32	22	48	-do-	-do-
45.	89	23	44	51	-do-	-do-
46.	83	28	33	50.5	Biology	-do-
47.	97	25	50	54	-do-	-do-
48.	78	23	34	48	-do-	-do-
49.	49	12	28	36	-do-	-do-
50.	39	17	17	36	-do-	-do-
51.	60	33	15.5	46	Agriculture	-do-
52.	98	12	60	50	-do	-do-
53.	80	8	51	42	-do-	-do-
54.	58	11	34	38	-do-	-do-
55.	81	17	41.5	46.5	-do-	-do-
56.	59	17	28	41	Philosophy of Science	Selected
57.	44	20	17	38	-do-	-do-
58.	57	14	30	39	-do-	do-
59.	49	24	16.5	41	do-	-do-
60.	63	20	27.5	41	-do-	-do-
61.	89	36	41	52	Engineering	-do-
62.	80	30	30	50	-do-	-do-
63.	68	39	16.5	49.5	-do-	-do-
64.	46	30	10	42	-do	Rejected
65.	38	19	14	36.5	-do-	-do-
66.	47	34	8	43	Bio-Physics	-do-
67.	74	35	23	50	-do-	Selected
68.	45	39	4	44	-do-	Rejected
69.	43	17	19	37	-do-	Selected
70.	92	32	40	54	-do	-do-
71.	62	19	27	42	Metorology	do-
72.	71	17	35	43.5	do-	-do-
73.	27	19	7	33	-do-	Rejected
74.	38	26	8	39	-do-	-do
75.	96	69	25	36	-do-	Selected

Items selected 80%
Items rejected = 20%

APPENDIX XIV (Contd.)

(B) ITEM-ANALYSIS DATA FOR THE DISCRIMINATIVE AND DIFFICULTY VALUES OF ITEMS OF SCIENCE APTITUDE TEST (PHYSICS)

Sample Size for top Group = 100
Sample Size for Bottom Group = 100

Item No.	Correct Items (top group)	Correct Items (Bottom group)	Discriminative Value of each item	Difficulty value of each item	Remarks
1.	51	22	20	42	Selected
2	92	32	48.5	58.5	do
3.	24	30	—	—	Rejected
4.	65	30	22	48.5	Selected
5.	57	27	19	45	do
6.	76	56	14	59.5	Rejected
7.	62	27	22	47	Selected
8.	43	11	26	35.5	do
9	30	16	11.5	34	Rejected
10.	16	16	0	28	do
11.	43	30	8	43	do
12.	73	35	24.5	52	Selected
13.	27	16	10	33	Rejected
14.	59	16	30	42	Selected
15.	46	13	25	38	do
16.	57	35	14	48	Rejected
17.	76	46	20	55 5	Selected
18.	62	32	18	48.5	do
19.	73	46	21.5	55	do
20.	51	11	31	38.5	do
21.	51	11	31	38.5	do
22.	35	13	20	34	do
23.	65	13	38	42.5	do
24.	54	30	15	45.5	do
25.	92	38	45	59.5	do
26.	59	35	15	48.5	do
27.	43	13	24	37	do
28.	89	38	39	58.5	do
29.	97	65	35	70	do
30.	54	8	38	38	do
31.	57	54	7	53	Rejected
32.	89	35	41	58	Selected
33.	38	38	0	43.5	Rejected
34.	11	3	20	18	do
35.	57	16	30	42	Selected
36.	78	16	45	48	do
37.	78	19	40	49	do
38.	76	19	39	48	do

39.	30	11	19	32	Selected
40.	16	16	0	27	Rejected
41.	35	16	16	35.5	Selected
42.	25	8	20	28	do
43.	25	11	35	30	do
44.	48	8	35	36	do
45.	89	27	45	55	do
46.	53	5	37.5	33	do
47.	54	24	19	44	do
48.	35	19	12	36.5	Rejected
49.	65	8	45	40	Selected
50.	57	19	32	41	do

Items Rejected 24%
Items selected 76%

APPENDIX XIV (Contd.)

(C) ITEM-ANALYSIS DATA FOR THE DISCRIMINATIVE AND DIFFICULTY VALUES OF ITEMS OF SCIENCE APTITUDE TEST (CHEMISTRY)

Sample Size for top Group 100
Sample Size for Bottom Group 100

Item No.	Correct Items (top group)	Correct Items (Bottom Group)	Discriminative value of each Item	Difficulty value of each Item	Remarks
1.	98	63	40	70	Selected
2.	70	38	20	52	do
3.	80	15	47.5	48	do
4.	58	5	45	37	do
5.	99	60	49	70	do
6.	30	28	7	39	Rejected
7.	70	53	11.5	56	do
8.	45	18	20	39	Selected
9.	78	15	45	48	do
10.	40	13	22	36	do
11.	85	18	49	51	do
12.	8	13	—	—	Rejected
13.	78	30	31.5	52	Selected
14.	83	48	25	58.5	do
15.	30	18	10	35	Relected
16.	83	40	30	56.5	Selected
17.	55	33	13.5	46.7	Rejected
18.	83	48	25	58.5	Selected
19	85	48	27.5	59.3	do
20.	85	18	49	51	do
21.	58	13	34	41	do
22.	50	38	7	47	Rejected
23.	73	20	36	43	Selected
24.	28	13	15	32	do
25.	90	58	27	64	do
26.	95	30	55	59.5	do
27.	85	18	49	51	do
28.	45	20	18	41	do
29.	34	25	7	35	Rejected
30.	93	55	34	64	Selected
31	75	23	35	49	do
32.	48	8	35	35	do
33	63	13	36.5	42	do
34.	78	28	33	52	do

35.	90	38	40	59	do
36.	25	50	—	—	Rejected
37.	95	58	35	66	Selected
38.	95	55	40	65	do
39.	68	28	25	49	do
40.	68	10	32	46	do
41.	45	25	13.5	42	Rejected
42.	85	33	37	55	Selected
43.	70	30	25	50	do
44.	55	10	35	39	do
45.	88	13	56.5	50	do
40.	88	20	51	53	do
47.	23	13	10	29	Rejected
48.	63	15	34.5	43	Selected
49.	60	15	32	42	do
50.	53	13	30	39	do

Items Selected 80%

Items Rejected 20%

(D) ITEM-ANALYSIS DATA FOR THE DISCRIMINATIVE AND DIFFICULTY VALUES OF ITEMS OF SCIENCE APTITUDE TEST (BIOLOGY)

Sample Size for the top Group = 100
Sample Size for the Bottom Group = 100

Item No.	Correct Items (top group)	Correct Items (Bottom group)	Discriminatve value of each Item	Difficulty value of Each Item	Remarks
1.	54	29	16	45	Selected
2.	51	29	14.5	45	Rejected
3.	66	24	27	47	Selected
4.	71	32	25	51	do
5.	85	68	15.5	65	do
6.	51	32	12	45	Rejected
7.	66	10	43	42	Selected
8.	88	54	27	62	do
9.	51	15	26.5	40	do
10.	17	10	9	25	Rejected
11.	46	10	30	36	Selected
12.	93	29	52	58	do
13.	59	34	15	48	do
14.	54	20	23	42.5	do
15.	83	46	27	58	do
16.	76	44	21	55	do
17.	63	34	18	49	do
18.	76	59	12	59.5	Rejected
19.	81	46	25	58	Selected
20	27	5	25	27	do
21.	78	29	32.5	52	do
22.	90	32	45	58	do
23	73	29	28	50.5	do
24.	54	20	23	42	do
25.	88	39	37.5	58.7	do
26.	78	27	34	52	do
27.	39	12	23	35	do
28.	66	5	50	39	do
29.	27	12	15	31	do
30.	41	22	13.5	40	Rejected
31	76	34	27.5	53	Selected
32.	54	17	26.5	41.5	do
33,	73	22	34	48	do
34.	61	22	26	45	do

35.	44	29	10	42.5	Rejected
36.	66	22	29	46	Selected
37.	29	17	10	34	Rejected
38.	66	22	50	39	Selected
39.	41	15	20	37	do
40	93	44	40	61	do
41.	71	20	35	47	do
42.	73	20	36	48	do
43.	81	22	41	51	do
44.	93	51	37	63	do
45.	71	24	30	48.5	do
46.	66	12	40	42	do
47.	95	37	50	60	do
48.	76	17	41	48	do
49.	78	27	34	37.5	do
50.	81	24	40	51.5	do

Items selected. -86%

Items Rejected =. 14%

(E) ITEM-ANALYSIS DATA FOR THE DISCRIMINATIVE AND DIFFICULTY VALUES OF ITEMS OF SCIENCE APTITUDE TEST (MATHEMATICS)

Sample Size For Top Group- 100
Sample Size For Bottom Group=100

Item No	Correct Items (top Group)	Correct Items (Bottom group)	Discriminative value of each Item	Difficulty value of each Item	Remarks
1.	47	12	28	38	Selected
2.	32	23	7	37	Rejected
3.	50	15	26	39	Selected
4.	12	18	—	—	Rejected
5	21	6	20	25	Selected
6.	47	21	18	41	do
7.	59	29	18	46.5	do
8.	50	21	20	42	do
9.	32	15	15	34	do
10.	18	18	0	30	Rejected
11.	62	41	13	51	do
12.	64	21	29	45	Selected
13.	59	35	15	49	do
14	62	21	27	45	do
15.	53	23	20	43	do
16.	67	26	26	48	do
17	35	35	0	42	Rejected
18	70	50	13	55	do
19.	64	38	15.5	50.5	Selected
20	21	8	17.5	26	do
21.	88	44	34	59.5	do
22.	97	64	37	70	do
23.	35	21	10	38	Rejected
24.	47	9	32.5	36	Selected
25.	35	12	20	34	do
26.	73	38	22	53	do
27.	59	15	31.5	42	do
28.	62	18	30.5	43.5	do
29	85	44	30	58.5	do
30.	70	41	18	53	do
31	53	23	20	43	do
32.	62	12	37.5	41	do
33.	44	18	19.5	39	do

34.	50	12	30	38 5	Selected
35.	44	15	22.5	38	do
36.	62	38	15	50	do
37.	38	21	13	38.5	Rejected
38.	56	15	30	41	Selected
39.	67	18	34	45	do
40.	62	26	23	46.5	do
41.	41	15	20.5	37	do
42.	23	3	29.5	24 5	do
43.	29	15	13.5	33.5	Rejected
44.	0	3	—	—	do
45.	35	18	13.5	36 5	do
46	29	15	13.5	33.5	do
47.	9	6	8.5	19	do
48.	41	26	10	41	do
49.	64	15	35	43	Selected
50.	59	23	24	45	do

Items selected .72%

Items rejected .28%

(F) AN ANALYSIS OF THE ITEMS SELECTED AND REJECTED ON THE BASIS OF DISCRIMINATIVE AND DIFFICULTY VALUES

COMPULSORY PART

Areas	Thought type items		
	Items Rejected		Items Selected
Physics	0	+	7
Chemistry	3	+	4
Biology	3	+	6
Mathematics	0	+	7
Astronomy	3	+	2
Physiology & Hygiene	0	+	5
Bio-chemistry	0	+	5
Geology	0	+	5
Agriculture	0	+	5
Philosophy of Science	0	+	5
Engineering	2	+	3
Bio-Physics	2	+	3
Meteorology	2	+	3
Total	15	+	60
	20%		80%

OPTIONAL PART OF THE TEST

Areas	Factual type Items			Thought type Items			Total		
	Items rejected		Items selected	Items rejected		Items selected	Items rejected		Items selected
1. Physics	7	+	23	5	+	15	12	+	38
2. Chemistry	7	+	23	3	+	17	10	+	40
3. Biology									
(i) Zoology	3	+	12	2	+	8	5	+	20
(ii) Botany	2	+	13	0	+	10	2	+	23
4. Mathematics	7	+	23	7	+	13	14	+	36
	26	+	94	17	+	63	43	+	157
	22% (Nearest round figure)		78%	20%		80%	21%		79%
Total	(120)			(80)			(200)		

In all, items selected = 79.5%
In all, items rejected = 20.5%

APPENDIX XV

Sample Size - 400 (10% of population)

(A) DATA FOR THE RELIABILITY OF THE COMPULSORY PART OF THE SCIENCE APTITUDE TEST

Sl. No.	No. of Students passing at the item	The No. of students failing at the item	p propotion passing at the item	q proprotion failing at the item
1.	148	252	0.37 (148/400)	0.63 (252/400)
2.	258	142	0.645	0.355
3.	144	256	0.36	0.64
4.	135	265	0.3375	0 6625
5.	161	239	0 4025	0.5975
6.	281	119	0.7025	0.2975
7.	223	177	0.5575	0.4425
8.	106	294	0·265	0.735
9.	126	274	0.315	0.685
10.	162	238	0.405	0.595
11.	142	258	0.355	0.645
12.	168	232	0.42	0.58
13.	310	90	0.775	0.225
14.	111	289	0.2775	0.7225
15.	88	312	0.22	0.78
16.	195	205	0.4875	0.5125
17.	190	210	0.475	0.525
18.	120	280	0.30	0 70
19.	136	264	0.34	0 66
20.	53	347	0.1325	0.8675
21.	178	222	0.445	0.555
22.	223	177	0.5575	0.4425
23.	239	161	0.5975	0.4025
24.	307	93	0.7675	0.2325
25.	144	256	0.36	0.64
26.	106	294	0.265	0.735
27.	180	220	0.45	0.55
28.	198	202	0.495	0.505
29.	226	174	0.565	0.435
30.	190	210	0.475	0.525
31.	106	294	0.215	0.785
32.	183	217	0 4575	0.5425
33.	153	247	0.3825	0.6175
34.	122	278	0.305	0.695
35.	129	271	0.3225	0.6775

36	121	279	0.3025	0.6975
37.	161	239	0.4025	0 5975
38	255	145	0 3625	0 6375
39.	136	264	0 34	0 66
40.	225	175	0.5625	0 4375
41.	229	171	0 5725	0 4275
42.	237	163	0.5925	0.4075
43.	115	285	0.2875	0.7125
44.	177	223	0.4425	0.5575
45.	179	221	0.4475	0.5525
46.	198	202	0.495	0.505
47.	215	185	0.5375	0.4625
48.	163	237	0.4075	0.5925
49.	96	304	0 24	0.76
50.	93	307	0.2425	0.7575
51.	172	228	0.43	0.57
52.	170	230	0.425	0.575
53.	138	262	0.445	0.555
54.	90	310	0.225	0.775
55.	145	255	0.3625	0.6375
56.	137	263	0.3425	0 6575
57.	104	296	0.26	0.74
58.	122	278	0.305	0 695
59.	136	264	0.34	0.66
60.	141	259	0.3525	0.6475
61.	222	178	0.555	0.445
62.	193	207	0.4825	0.5175
63.	181	219	0.4525	0.5475
64.	124	276	0.31	0.69
65.	111	289	0.2775	0.7225
66.	199	201	0.4975	0.5025
67.	178	222	0.445	0.555
68.	132	268	0.33	0.67
69.	81	319	0.2025	0.7975
70.	228	172	0.57	0.43
71.	146	254	0.365	0.635
72.	141	259	0.3525	0.6475
73.	87	313	0.2175	0.7825
74.	112	288	0.28	0.72
75.	281	119	0.7025	0.2975

$\Sigma pq = 16,7379$

$$r = \frac{n}{n-1}\left(\frac{Sdt^2 - \Sigma pq}{(Sdt^2)}\right)$$

$Sdt^2 = 158.78$

$n = 75$

$r_{11} = 0.89$

Class Intervals	Frequency
0-4	4
5-9	3
10-14	17
15-19	51
20-24	68

Class Intervals	Frequency
25-29	68
30-34	50
35-39	40
40-44	38
45 49	24
50-54	15
55 59	15
60-64	7

Sample Size=136 (10% of Population)

(B) DATA FOR THE RELIABILITY OF THE OPTIONAL PART OF THE SCIENCE APTITUDE TEST—PHYSICS

S No.	No. of Students passing the Item	No. of Students failing at the item.	p=proprotion passing at the Item	q=proprotion failing at the Item
1.	54	82	54/136	82/136
2.	83	53	83/136	53/126
3	34	102	34/136	102/136
4	57	79	57/130	79/136
5	69	67	69/136	67/136
6.	86	50	86/136	50/136
7.	54	82	54/136	82/136
8	35	101	35/136	101/136
9	39	97	39/136	97/136
10.	26	110	26/136	110/136
11.	57	79	57/136	79/136
12.	67	69	67/136	69/136
13.	29	107	29/136	107/136
14.	50	86	50/136	86/136
15.	41	95	41/136	95/136
16.	85	51	85/136	51/136
17.	87	49	87/136	49/136
18.	64	72	64/136	72/136
19.	86	50	86/136	50/136
20.	44	92	44/136	92/136
21.	30	106	30/136	106/136
22.	22	114	22/136	114/136
23.	44	92	44/136	92/136
24.	61	75	61/136	75/136
25.	91	45	91/136	45/136
26.	62	74	62/136	74/136
27.	35	101	35/136	101/136
28.	89	47	89/136	47/136
29.	116	20	116/136	20/136
30.	36	100	36/136	100/136
31.	99	37	99/136	37/136
32.	91	45	91/136	45/136
33.	51	85	51/136	85/136
34.	11	125	11/136	125/136
35	46	90	46/136	90/136
36.	51	85	51/136	85/136

37.	57	79	57/136	79/136
38.	66	70	66/136	70/136
39.	25	111	25/136	111/136
40.	16	120	16/136	120/136
41.	48	88	48/136	88/136
42.	35	101	35/136	101/136
43.	27	109	27/136	109/136
44.	42	94	42, 136	94/136
45.	75	61	75/136	75, 136
46.	31	105	31/136	105/136
47.	45	91	45/136	91/136
48.	46	90	40/136	90/136
49.	54	82	54/133	82/136
50.	51	85	51/136	85/136

r_{11} = 0.83 Σpq 10·58

Frequency distribution of the Test Scores.

Intervals	Frequency
0-5	2
5-10	7
10-15	30
15-20	39
20-25	31
25-30	14
30-35	8
35-40	5

Sample Size=146

(C) DATA FOR THE RELIABILITY OF THE OPTIONAL PART OF THE SCIENCE APTITUDE TEST-CHEMISTRY

S. No.	No. of students passing the Item	No. of students failing the item	p=proportion passing at the item	q=proportion failing at the Item
1.	117	29	117/146	29/146
2.	65	81	65/146	81/146
3.	69	77	69/146	77/146
4.	41	105	41/146	105/146
5.	14	132	14/146	132/146
6.	43	103	43/146	103/146
7.	74	72	74/146	72/146
8.	42	104	42/146	104/146
9.	55	91	55/146	94/146
10.	44	102	44/146	102/146
11.	64	82	64/146	82/146
12.	21	125	21/146	125/146
13.	79	67	79/146	67/146
14.	101	45	101/146	45/146
15.	43	103	43/146	103/146
16.	88	58	88/146	58/146
17.	79	67	79/146	72/146
18.	100	46	100/146	46/146
19.	93	53	93/146	53/146
20.	78	68	78/146	68/146
21.	51	95	51/146	95/146
22.	55	91	55/146	91/146
23.	64	82	64/146	82/146
24.	29	117	23/146	117/146
25.	102	44	102/146	44/146
26.	93	53	93/146	53/146
27.	71	75	71/146	75/146
28.	46	100	46/146	100/140
29.	37	109	37/146	109/146
30.	106	40	106/146	40/146
31.	64	82	64/146	82/146
32.	26	120	26/146	122/146
33.	50	96	50/146	96/146
34.	67	79	67/146	79/146
35.	97	49	97/146	49/146
36	58	88	58/146	88/146
37.	112	34	112/146	34/140
38.	114	32	114/146	32/140

39.	57	89	57/146	89/146
40.	52	94	52/146	94/146
41.	57	89	57/146	89/146
42.	88	58	88/146	58/146
43.	70	76	70/146	70/146
44.	40	106	40/146	106/146
45.	74	72	74/146	72/146
46.	67	79	67/146	79/146
47.	26	120	26/146	120/146
48.	59	87	59/146	87/146
49.	49	97	49/146	97/146
50.	30	116	30/146	116/146

$\Sigma pq = 10.78$

$r_{11} = 0.86$

Frequency Distribution of the Test Scores

Class Intervals	Frequency
5-9	4
10-14	15
15-19	44
20-24	26
25-29	25
30-34	19
35-39	9
40-44	3
45-49	1

APPENDIX XV (Contd)

Sample Size=141 (10% of the population)

(D) CALCULATION OF RELIABILITY OF BIOLOGY PART OF SCIENCE APTITUDE TEST=1966

S. No.	No. of students passing at the item	No. of students failing at the item	p=proportion passing at the item	q=proportion failing at the item
1.	64	77	64/141	77/141
2.	60	81	60/141	81/141
3.	67	74	67/141	74/141
4.	71	70	71/141	70/141
5.	117	24	117/141	24/141
6.	53	88	53/141	88/141
7.	43	98	43/114	98/141
8.	109	32	109/141	32/141
9.	47	94	47/141	94/141
10.	16	125	16/141	125/141
11.	39	102	39/141	102/141
12.	80	61	80/141	61/141
13.	55	86	55/141	86/141
14.	50	85	50/141	85/141
15.	97	44	97/141	44/141
16.	95	46	95/141	46/141
17.	75	60	75/141	66/141
18.	97	44	97/141	44/141
19.	104	37	104/141	37/141
20.	23	118	23/141	118/141
21	72	69	72/141	69/141
22.	95	46	95/141	46/141
23.	84	57	84/141	57/141
24.	60	81	60/141	81/151
25.	87	54	87/141	54/141
26.	75	66	75/141	66/141
27.	39	102	39/141	102/141
28.	45	96	45/141	96/141
29.	29	112	29/141	112/141
30.	61	80	61/141	80/141
31.	75	66	75/141	66/141
32.	50	91	50/141	91/141
33.	73	68	73/141	68/141
34.	54	87	54/141	87/141
35.	59	82	59/141	82/141
36.	78	63	78/141	63/141
37.	39	102	39/141	102/141

38.	37	.04	37/141	104/141
39.	40	101	40/141	101/141
40.	108	33	108/141	33/141
41.	67	74	37/141	74/141
42.	67	74	67/141	74/141
43.	62	79	62/141	79/141
44.	112	29	112/141	29/141
45.	60	81	60/141	81/141
46.	68	73	68/141	73/141
47.	91	50	91/141	50/141
48.	71	70	71/141	50/141
49.	78	63	78/141	63/141
50.	83	58	83/141	58/141

$\Sigma pq = 11.21$

r. 0.82

Frequency Distribution of the Test Scores.

Interval	Frequency
0.5	1
5.10	7
10-15	22
15-20	35
20-25	36
25-30	25
30-35	16
35-40	5
40-45	3
45-50	1

Sample Size N=125 (13% of the population)

(E) CALCULATION OF RELIABILITY OF MATHEMATICS PART OF SCIENCE APTITUDE TEST=1966

S. No.	No. of students passing the items	No. of students failing the item	p=proportion passing at the item	q=proportion failing at the item
1.	28	97	28/125	97/125
2.	34	91	34/125	91/125
3.	35	90	35/125	90/125
4.	26	99	26/125	99/125
5	18	107	18/125	107/125
6.	49	76	49/125	76/125
7.	49	76	49/125	76/125
8.	41	84	41/125	84/125
9	34	91	34/125	91/125
10.	27	98	27/125	98/125
11.	60	65	60/125	65/125
12.	52	73	52/125	73/125
13.	63	62	63/125	62/125
14.	43	82	43/125	82/125
15	41	84	41/125	84/125
16.	69	56	69/125	56/125
17.	44	81	44/125	81/125
18.	75	50	75/125	50/125
19.	56	69	56/125	69/125
20.	20	105	20/125	105/125
21.	82	43	82/125	43/125
22	98	27	98/125	27/125
23.	31	94	31/125	94/125
24.	36	89	36/125	89/125
25.	32	93	32/125	93/125
26.	73	52	73/125	52/125
27.	43	82	43/125	82/125
28.	45	80	45/125	80/125
29.	71	54	71/125	54/125
30.	70	55	70/125	55/125
31.	42	83	42/125	83/125
32.	36	89	36/125	89/125
33.	32	93	32/125	93/125
34	36	89	36/125	89/125
35.	35	90	35/125	90/125
36.	64	61	64/125	61/125

37.	40	85	40/125	85/125
38.	44	81	44/125	81/125
39.	59	66	59/125	66/125
40.	51	74	51/125	74/125
41.	40	85	40/125	85/125
42.	14	111	14/125	111/125
43.	35	90	35/125	90/125
44.	8	117	8/125	117/125
45	32	93	32/125	93/125
46	18	107	18/125	107/125
47	14	111	14/125	111/125
48.	43	82	43/125	82/125
49.	53	72	53/125	72/125
50.	42	83	42/125	42/125

$\Sigma pq = 10.20$

$r = 0.72$

Frequency distribution of the Test Scores.

Interval	Frequency
0-5	3
5-10	5
10-15	39
15-20	47
20-25	19
25-30	9
30-35	3

APPENDIX XVI

FIGURES AT A GLANCE

	Science Aptitude Test	Essay	Interview	Project-Report
Science Aptitude Test	—	0.25*	0.27*	0.35*
Essay	0.25*	—	0.16*	0.16*
Interview	0.37*	0.16*	—	0.03
Project Report	0.35*	0.16*	0.03	—

* Indicates significance at 0.05 Level,

APPENDIX XVI (Contd.)

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUDE TEST & INTERVIEW IN THE S.T.S. EXAMINATION, YEAR 1966.

SAMPLE SIZE :—168 (Representing the population of candidates who appeared for the Interview)

Interview/S.A. Test %of Marks	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
20-30	—	—	1	—	—	—	—	—	—	—
30-40	1	1	1	1	1	1	—	—	—	—
40-50	3	5	14	3	5	3	—	1	—	—
50-60	3	3	16	6	2	2	3	1	—	—
60-70	4	8	9	9	3	3	1	2	—	—
70-80	1	2	1	5	5	3	2	1	1	1
80-90	1	2	6	4	5	—	3	—	—	—
90-100	—	—	—	3	3	2	—	—	1	—

r=0.27

The value of r is significant at 0.05 level

Table 2

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUDE TEST & PROJECT REPORT IN THE S.T.S EXAMINATION, YEAR 1966.

SAMPLE SIZE :—325 (Representing the population of Candidates who took the Examination)

S.A T's / Project Report Marks.	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	100–110
0– 5	24	20	17	12	6	7	—	—	—	—	—
5–10	23	33	21	23	21	10	11	7	3	—	—
10–15	7	7	13	7	8	8	7	6	4	2	—
15–20	—	1	3	2	1	5	1	2	—	—	—
20–25	—	—	1	—	—	1	—	—	—	—	1

$r = 0.35$

The value of r is signi ficant at 0.05 level

Table No 3

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUTE TEST & ESSAY PAPER IN THE S.T.S. EXAMINATION, YEAR 1966.

SAMPLE SIZE :—(325 Representing the population of Candidates who took the Examination)

S. A. T's / Essay Marks.	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	80–90	90–100	100–110
0–5	5	6	6	6	3	—	—	—	—	—	—
5–10	3	12	7	2	3	3	1	1	1	—	—
10–15	14	9	6	7	5	4	—	1	—	—	—
15–20	21	14	8	6	9	7	8	4	1	1	—
20–25	8	12	17	11	13	3	3	4	3	1	1
25–30	—	6	9	8	2	7	4	4	1	1	—
30–35	1	2	2	2	1	4	1	1	—	—	—
35–40	—	—	2	3	—	1	1	—	1	—	—
40–45	—	—	—	—	1	—	—	—	—	—	—

$r = 0.25$

The value of r is significant at 0.05 level

Table 4

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE MARKS SCORED BY THE CANDIDATES IN ESSAY PAPER & PROJECT REPORT IN THE S.T.S. EXAMINATION, YEAR 1966

SAMPLE SIZE :—325 (Representing the population of Candidates who took the Examination)

ESSAY/Project Report Marks	0-5	5-10	10-15	15-20	20-25	25–30	30-35	35–40	40–45	45-50
0–5	11	10	11	18	22	9	3	2	—	—
5-10	12	16	19	38	39	22	5	1	—	—
10–15	3	3	12	18	16	8	5	3	1	—
15-20	—	1	3	4	3	2	1	1	—	—
20–25	—	—	—	—	1	2	—	—	—	—

r=0.16

The value of r is significant at 0.05 Level

Table 5

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE MARKS SCORED BY THE CANDIDATES IN INTERVIEW & PROJECT REPORT IN THE S.T.S. EXAMINATION, YEAR 1966

SAMPLE SIZE:—168 (Representing the population of candidates who appeared for the Interview)

terview/Project eport Marks	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
1-3	—	1	2	—	2	—	2	—	—	1
4-6	2	1	11	3	1	3	—	2	—	—
7-9	5	9	10	7	4	2	1	—	1	—
10-12	5	6	15	16	9	8	4	2	—	—
13-15	—	1	6	2	2	—	1	1	—	—
16-18	—	3	4	1	3	1	1	—	—	—
19-21	1	—	—	2	3	—	—	—	1	—

r=0.03

The value of r is not significant at 0.05 Level.

Table 6

DEGREE OF ASSOCIATION (BETWEEN THE MARKS SCORED BY THE CANDIDATES IN INTERVIEW AND ESSAY PAPER IN THE N.S.T.S. EXAMINATION, YEAR 1966

SAMPLE SIZE : 168 (Representing the population of those who appeared for interview)

Marks in Interview/ Marks in Essay paper	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
5-10	1	—	1	—	—	—	—	—	—	—
10-15	4	2	3	—	—	1	—	—	1	—
15-20	2	2	7	7	2	2	2	1	—	1
20-25	1	7	15	9	7	2	1	1	—	—
25-30	3	5	9	8	7	5	1	—	—	—
30-35	1	2	6	3	6	4	2	2	—	—
35-40	1	3	5	4	1	—	3	1	1	—
40-45	—	—	2	—	—	—	—	—	—	—
45-50	13	21	48	31	24	14	9	5	2	1

r=0.16

The value of r is significant at 0.05 Level.

APPENDIX XVII

CORRELATIONAL FIGURES AT A GLANCE

Table No.	Specification	N	(r)	Significance Level
1.	NSTS Total X Physics (High School)	170	0.17	0.05
2.	NSTS Total X Chemistry (High School)	173	0.4	0.05
3.	NSTS Total X Mathematics (High School)	175	0.01	Not Significant
4.	NSTS Total X Biology (High School)	110	0.20	0.05
5.	NSTS Total X General Science (High School)	90	0.70	0.05
6.	NSTS Total X Total in science Subject (High School)	246	0.04	Not Significant
7.	NSTS Total X Physics (Hr. Sec.)	256	0.17	0.05
8.	NSTS Total X Chemistry (Hr. Sec.)	252	0.18	0.05
9.	NSTS Total X Mathematics (Hr. Sec.)	234	0.15	0.05
10.	NSTS Total X Biology (Hr. Sec.)	100	0.30	0·05
11.	NSTS Total X Hr. Sec. Total (Science Subjects)	246	0.22	0.01
12.	High School total X Hr. Sec. total (Science Subjects.)	250	0.37	0.01
13.	Math. (High School) X Chem. (High School	150	0.49	0.01
14.	Math. (H.S.) X Phy. (H.S.)	150	0.53	0.01
15.	Math. (H.S.) X Biology (H.S.)	150	0.07	Not Significant
16.	Chem. (H.S.) X Biology (H.S.)	150	0.27	0.05
17.	Chem· (H.S.) X Physics (H.S.)	150	0.49	0.01
18.	Chem. (H.S.) X Biology (H.S.)	150	0.20	0.05
19.	Math (H.S.) X S.A.T. Total	150	—0.21	Not Significant
20.	Chemistry (H.S.) X S.A.T. Total	150	0.09	do
21.	Physics (H.S.) X S.A.T. Total	150	—0.13	do
22.	Biology (H.S.) X S.A.T. Total	150	0.24	0.05
	$R_{S.A.T.}$ (Phy. Chem. Math. & Biology)		—0.346	0.05
23.	Mathematics (H·S.) X Essay Paper	150	—0 096	Not Significant
24.	Chemistry (H.S.)X Essay Paper	150	—0.187	do
25	Physics (H.S.) X Essay paper	150	—0.137	do
26.	Biology (H.S.) X Essay Paper	150	—0 043	do

	R_{ESSAY} (Phy. Chem. Math. & Biology)	=	0.2	Not Significant
27.	Mathematics (H S.) X Project Report	150	—0.306	0.05
28.	Chemistry (H.S.) X Project Report	150	—0 109	do
29.	Physics (H.S.) X Project Report	150	—0.161	do
30.	Biology (H.S) X Project Report	150	0.05	Not Significant
	$R_{Project\ Reports}$ (Phy. Chem. Math. & Biology)	=	0.28	do
31.	Mathematics (H. S.) X Interview Marks	150	—0.137	do
32.	Chemistry (H.S.) X Interview Marks	150	0.096	do
33.	Physics (H.S.) X Interview Marks	150	—0.014	do
34.	Biology (H.S.) X Interview Marks	150	.097	do
	$R_{Interview}$ (Phy. Chem. Biology & Math)	=	0.24	Not Significant

Table 1

APPENDIX XVII

Emperical Validity

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGH SCHOOL MARKS IN PHYSICS AND MARKS IN THE S.T.S. EXAMINATION

SAMPLE SIZE : 170 (Representing the population of Candidates who appeared for the interview)

S.T S. Marks / Physics %of Marks	76-85	86-95	96-105	106-115	116-125	126-135	136-145	146-156	156-165	166-175	176-185	186-195
40-45	1	—	3	1	1	—	—	—	—	—	—	—
45-50	—	—	—	1	—	—	1	1	—	—	—	—
50-55	—	1	6	1	3	1	1	1	1	—	—	—
55-60	2	5	—	—	3	3	1	2	—	—	—	—
60-65	2	7	5	3	5	3	2	1	—	1	—	—
65-70	3	5	4	7	5	2	3	—	—	—	—	—
70-75	2	8	4	5	2	2	4	1	2	1	—	—
75-80	2	2	7	4	4	—	—	—	—	—	—	—
80-85	—	—	3	2	2	3	2	—	—	—	1	—
85-90	—	—	—	—	1	1	3	1	—	—	—	—
90-95	—	—	—	—	1	—	—	—	—	1	—	—
95-100	—	—	—	—	—	—	—	—	—	—	—	1

$r = 0.17$

The value of r is significant at 0.05 Level

$$r = \frac{\left[\frac{1}{N}\Sigma fxy - \bar{x}\bar{y}\right]}{\left\{\left[\frac{1}{N}\Sigma fx^2 - \bar{x}^2\right]\left[\frac{1}{N}\Sigma fy^2 - \bar{y}^2\right]\right\}^{\frac{1}{2}}}$$

$$\bar{x} = \frac{1}{N}\Sigma fx \quad \bar{y} = \frac{1}{N}\Sigma fy.$$

Table 2

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGH SCHOOL MARKS IN CHEMISTRY AND MARKS IN THE S.T.S. EXMINATION (1966)

SAMPLE SIZE —173 (Representing the population of Candidates who appeared for the interview)

S T S. (Marks) / Chemistry %of Marks	76-85	86-95	96-105	106-115	116-125	125-135	136-145	146-155	156-165	166-175	176-185	186-195
40-45	1	—	1	1	—	—	—	—	—	—	—	—
45-50	—	—	1	1	—	1	—	—	—	—	—	—
50-55	1	1	—	—	2	1	—	1	1	—	—	—
55-60	1	5	7	3	3	3	1	2	—	—	—	—
60.65	1	6	3	5	6	3	3	2	—	—	—	—
65-70	2	7	9	6	5	3	3	1	1	—	—	—
70-75	1	7	9	2	2	2	—	—	1	—	—	—
75-80	3	4	2	3	4	1	3	—	—	2	1	—
80-85	—	—	3	3	3	1	1	—	—	1	—	—
85-90	—	—	3	—	—	—	3	1	—	—	—	—
90-95	—	—	—	—	1	—	3	—	—	—	—	—
95-100	—	—	—	—	1	—	—	—	—	—	—	1

r=0.4

The Value of r is significant at .05 Level

Table 3

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGH SCHOOL MARKS IN MATHEMATICS AND MARKS IN THE N.S.T.S. EXAMINATION (1966)

SAMPLE SIZE :—175 (Representing the population of Candidates who apppeared for the interview)

S.T.S. (Marks) / Mathematics % of Marks	76-85	86-95	96-105	106-115	116-125	126-135	136-145	146-155	156-165	166-175	176-185	186-195
40-45	—	—	—	—	—	1	—	—	—	—	—	—
45-50	—	—	1	1	1	—	—	—	—	—	—	—
50-55	—	—	1	—	1	—	—	1	1	—	—	—
55-60	—	—	1	2	—	—	—	1	—	—	—	—
60-65	1	2	3	—	4	2	1	—	—	—	—	—
65-70	2	2	5	3	2	2	—	—	—	—	—	—
70-75	2	7	3	1	1	3	3	2	1	—	—	—
75-80	2	7	7	1	4	2	—	1	—	—	—	—
80-85	4	4	1	3	2	1	3	—	—	—	—	—
85-90	1	3	6	6	2	1	2	1	1	—	1	—
90-95	—	3	3	5	5	2	3	—	—	1	—	—
95-10,	2	3	5	4	3	—	3	1	—	1	—	1

r=0 01

The value of r is significant 0.05 Level.

Table 4

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGH SCHOOL MARKS IN BIOLOGY AND MARKS IN THE N.S.T.S. EXAMINATION (1966)

SAMPLE SIZE :—110 (Representing the population of Candidates who appeared for the interview)

S.T S (Marks) / Biology (% of Marks)	76-85	86-95	96-105	106-115	116-125	126-135	136-145	146-155	156-165	166-175
45-50	1	2	3	1	—	—	1	—	—	—
50-55	—	5	3	2	2	1	—	1	—	—
55-60	3	7	4	5	3	2	2	—	—	—
60-65	—	6	6	6	2	1	1	—	—	1
65-70	1	3	6	4	3	—	1	1	—	—
70-75	—	2	1	2	—	1	2	—	1	—
75-80	—	3	2	1	—	—	1	1	—	1
80-85	—	—	—	—	1	—	—	—	—	—
85-90	—	—	—	—	—	1	—	—	—	—

r=0.20

Significant at 0.05 Level

Table 5

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGH SCHOOL MARKS IN GENERAL SCIENCE (GENERAL PHYSICS, GENERAL CHEMISTRY, GENERAL BIOLOGY) AND MARKS IN N.S.T.S. EXAMINATION (1966)

SAMPLE SIZE :—50 (Representing the population of candidates who appeared for the interview .

S. T. S. (Marks) / General Science % of Marks	76–85	86-95	96-105	106-115	116–125	126–135	136-145	146-155	156–165	166-175	176-185
50-55	1	2	3	2	—	—	—	—	—	—	—
55-60	—	1	2	2	—	1	—	—	—	—	—
60-65	2	2	2	1	1	1	—	—	—	—	—
65-70	—	4	3	2	4	—	1	—	—	—	—
70-75	1	3	3	—	3	—	3	—	—	—	—
75-80	—	—	7	2	3	—	—	—	—	—	1
80-85	2	1	3	2	2	—	1	—	—	—	—
85-90	2	1	1	2	1	—	1	1	—	1	—
90-95	—	—	1	1	—	—	—	—	—	—	—
95-100	—	—	—	—	1	—	—	—	—	—	—

r=0.70

The value of r is Highly Significant.

Table 6

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGH SCHOOL MARKS IN SCIENCE SUBJECTS (PHYSICS, CHEMISTRY, MATHEMATICS AND BIOLOGY) AND MARKS IN NSTS EXAMINATION

SAMPLE SIZE .—246. (Representing final awardees).

% of High School marks/S.T.S Marks	50–55%	55-60%	60-65%	65-70%	70–75%	75–80%	80–85%	85–90%	90-95%	95-100%
113-118	—	4	6	10	14	2	7	4	2	—
118-123	—	3	7	6	10	4	7	2	—	—
123-128	—	3	6	6	8	3	1	1	1	—
128-133	1	2	7	3	7	1	4	2	—	—
133-138	—	2	2	4	2	4	2	—	1	—
138-143	—	3	4	5	4	2	10	3	—	—
143-148	—	4	3	2	2	1	2	—	—	—
148-153	—	4	—	3	3	2	2	—	—	—
153-158	—	1	—	2	—	2	—	2	—	—
158-163	—	1	—	2	1	1	2	—	—	—
163-168	—	1	—	1	1	—	—	1	—	—
168-173	—	—	1	—	1	—	—	—	—	—
173-178	1	—	1	—	—	—	—	1	—	—
178-183	—	—	—	—	—	—	2	—	—	—
183-188	—	—	—	—	—	—	—	—	—	—
188–193	—	—	—	—	—	—	—	—	—	1

r=0.04

The value of r is not significant at 0 05 Level

Table 7

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGHER SECONDARY MARKS IN PHYSICS AND MARKS IN THE N.S.T.S. EXAMINATION

SAMPLE SIZE :— 256 (Representing Final Awardees)

% of Marks Physics / S T.S. Marks	45–50%	50–55%	55–60%	60–65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
113-123	3	3	5	11	12	18	17	9	6	4
123-133	—	2	2	8	13	17	11	4	6	3
133-143	1	1	3	4	7	2	15	10	—	4
143-153	—	—	2	2	7	3	6	4	1	4
153-163	—	—	1	4	2	2	1	2	1	2
163-173	—	1	—	—	—	—	1	1	2	2
173-183	—	—	1	—	1	—	1	—	—	—
183-193	—	—	—	—	—	—	—	—	1	—

$r = 0.17$

The Value of r is significant at 0.05 Level

Table 8

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGHER SECONDARY MARKS IN CHEMISTRY AND MARKS IN THE N S T S. EXAMINATION

SAMPLE SIZE .—252 (Representing Final Awardees)

% Marks in Chemistry / S.T.S. Marks	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
113-123	6	8	8	19	14	13	12	5	5	—
123-133	4	3	8	17	8	12	5	4	1	—
133-143	1	1	3	10	5	13	2	6	5	—
143-153	—	3	1	9	3	5	3	2	3	—
153-163	—	1	—	4	2	2	3	2	1	—
163-173	—	1	—	1	—	1	—	1	2	1
173-183	—	1	—	—	—	2	—	—	—	—
183-193	—	—	—	—	1	—	—	—	—	—

r=0.18

The Value of r is sign ficant at 0.05 Level

Table 9

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGHER SECONDARY MARKS IN MATHEMATICS AND MARKS IN THE N.S.T.S. EXAMINATION

SAMPLE SIZE :—234 (Representing Final Awardees)

% of Marks in Mathematics / S.T.S. Marks	45–50%	50–55%	55–60%	60–65%	65–70%	70–75%	75–80%	80–85%	85–90%	90–95%	95–100%
113-123	5	2	2	5	9	6	8	7	8	21	9
123-133	—	—	1	6	6	3	8	7	6	15	6
133-143	—	—	1	2	2	4	3	5	9	10	6
143-153	—	—	—	—	2	2	2	4	1	10	4
153-163	—	—	—	—	—	1	1	4	2	5	3
163-173	—	—	—	1	—	—	1	1	—	3	1
173-183	—	—	—	—	1	—	—	—	—	2	—
183-193	—	—	—	—	—	—	—	—	—	—	1

r=0.15

The value of r is significant at 0.05 Level

Table 10

DEGREE OF ASSOTIATION (CORRELATION) BETWEEN HIGHER SECONDARY MARKS IN BIOLOGY AND MARKS IN THE N.S.T.S. EXAMINATION

SAMPLE SIZE :—100 (representing Final Awardees)

% of Marks in Biology / S.T.S. (Marks)	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
113-123	6	8	5	4	2	4	2	1	—
123-133	4	3	2	6	4	1	—	—	—
133-143	—	1	10	5	—	3	—	1	—
143-153	—	2	3	4	4	—	—	—	—
153-163	—	—	2	1	3	1	1	—	1
163-173	—	—	—	1	3	—	—	—	—
173-183	—	—	—	1	—	—	—	—	—
183-193	—	—	—	—	1	—	—	—	—

r=0.3

The value of r is significant at 0.05 level

Table 11

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN HIGHER SECONDARY MARKS IN SCIENCE SUBJECTS (PHY. CHEM. MATHEMATICS & BIOLOGY) AND MARKS IN N.S.T.S. EXAMINATION

Sample size :—246 (Representing final awardees)

% of Higher Sec. Marks/N.S.T.S Marks	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
113-118	1	3	5	9	7	10	8	3	3
118-123	1	1	6	9	7	6	6	3	—
123-128	—	3	2	7	4	6	2	4	1
128-133	—	1	2	7	6	6	3	1	1
133-138	—	—	2	2	4	2	5	—	2
138-143	—	1	—	7	3	6	10	3	1
143-148	—	—	1	1	6	1	1	2	2
148-153	—	—	1	4	4	2	3	—	—
153-158	—	—	—	2	2	2	1	—	—
158-163	—	—	—	—	1	2	2	2	—
163-168	—	—	1	—	—	1	1	—	1
168-173	—	—	—	—	—	—	1	—	1
173-178	—	—	1	—	—	1	—	1	—
178-183	—	—	—	—	—	—	1	1	—
183-188	—	—	—	—	—	—	—	—	—
188-193	—	—	—	—	—	—	1	—	—

r=.22

Value of r is significent at .01 level

Table 12

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN MARKS SECURED IN SCIENCE SUBJECTS A HIGH SCHOOL LEVEL AND HIGHER SECONDARY LEVEL

SAMPLE SIZE :—250 (Representing population of final Awardees)

% of Marks secured in High School / % of Marks secured in Higher Secondary	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
50-55%	—	1	—	—	2	—	—	—	—	—
55-60%	—	2	3	2	—	2	—	1	—	—
60-65%	1	5	4	3	5	1	2	—	—	—
65-70%	1	8	10	13	7	3	5	2	—	—
70-75%	—	4	7	8	13	7	4	—	—	—
75-80%	—	3	7	10	11	4	4	5	1	—
80-85%	—	4	6	4	8	6	12	3	1	1
85-90%	—	1	1	3	5	1	9	2	—	—
90-95'	—	—	—	2	2	—	3	3	2	—

r=0.37

The value of r is significant at 0.01 level

Table 13

DEGREE OF ASSOCIATION (CORRELATION BETWEEN THE HIGH SCHOOL MARKS IN MATHEMATICS AND CHEMISTRY

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for the Interview)

% age of Marks in Chem/%age of Marks in Math.	45–50%	50–55%	55–60%	60–65%	65–70%	70–75%	75–80%	80–85%	85–90%	90–95%	95–100%
45–50%	—	2	2	2	—	—	—	—	—	—	—
50–55%	1	2	2	1	2	—	1	—	—	—	—
55–60%	—	1	2	2	1	—	—	—	—	—	—
60–65%	—	2	8	2	4	—	—	—	—	—	—
65–70%	2	4	3	3	3	2	—	—	—	—	—
70–75%	—	1	6	8	1	2	5	1	—	—	—
75–80%	—	—	—	5	7	—	6	—	1	—	—
80–85%	—	2	1	2	3	3	3	—	1	—	—
85–90%	1	—	—	2	6	4	2	3	—	1	—
90–95%	—	—	—	5	3	2	3	—	—	—	—
95–100%	—	—	—	—	1	3	2	—	—	—	—

r=0.486

The value of r is highly significant

Table 14

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN MATHEMATICS AND PHYSICS

SAMPLE SIZE —150 (Rpresenting the population of Candidates who appeared for the Interview)

% age of Marks in Physics/% age of Marks in Mathematics	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%
45-50%	—	1	3	1	—	1	—	—	—
50-55%	1	2	4	1	1	—	—	—	—
55-60%	2	—	1	1	1	1	—	—	—
60-65%	—	5	6	3	1	1	—	—	—
65-70%	1	2	6	4	1	1	2	—	—
70-75%	1	4	3	3	6	4	3	—	—
75-80%	—	1	1	6	4	2	4	1	—
80-85%	—	—	1	6	—	3	5	—	—
85-90%	—	1	2	7	—	3	1	5	—
90-95%	—	—	—	2	3	6	1	—	1
95-100%	—	—	—	—	1	—	3	2	—

r=0 53

The value of r is highly significant

Table 15

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN MATHEMATICS AND BIOLOGY

SAMPLE SIZE :—150 (Representing the Population of Candidates who appeared for the interview)

% age of Marks in Biology / % age of Marks in Mathematics	40–45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%
45-50%	—	—	—	—	—	3	3	—	—	—
50-55%	—	—	2	2	1	1	3	—	—	—
55-60%	—	—	1	2	—	2	—	1	—	—
60-65%	—	2*	—	2	6	2	3	—	1	—
65-70%	—	1	1	5	4	5	1	—	—	—
70-75%	—	—	3	3	4	6	4	4	—	—
75-80%	2	1	2	7	3	1	—	2	2	—
80-85%	—	—	2	2	2	3	2	2	1	—
85-90%	—	—	2	2	4	2	4	3	1	1
90-95%	2	1	1	2	2	2	2	—	1	—
95-100%	—	—	—	—	1	1	—	1	2	1

r=0.07

The value of "r" is not significant at 5% Level

Table 16

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN CHEMISTRY AND BIOLOGY

SAMPLE SIZE:—150 (Representing the population of Candidates who appeared for the Interview)

%age of Marks in Biology / % age of Marks Chemistry	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
40-45%	—	—	1	—	—	1	—	—	—	—	—
45-50%	—	1	—	—	1	4	1	1	—	—	—
50-55%	—	1	—	4	3	4	6	—	1	—	—
55-60%	—	1	3	4	5	6	3	2	1	—	—
60-65%	3	—	2	6	9	8	1	2	2	—	—
65-70%	—	2	3	9	4	—	3	4	3	—	—
70-75%	—	1	1	1	2	1	6	2	2	1	—
75-80%	1	—	4	2	4	—	1	—	—	1	—
80-85%	—	—	—	1	1	1	1	—	—	—	—
85-90%	—	—	—	—	—	—	—	1	—	—	—
90-95%	—	—	—	—	—						

r=0.27

the value of "r" is significant at 5% Level

Table 17

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN CHEMISTRY AND PHYSICS

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for the Interview)

% age of Marks in Physics / % age of Marks in Chemistry	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
40-45%	—	—	—	1	—	—	—	—	—	—	—
45-50%	—	—	—	1	1	1	—	—	—	—	—
50-55%	—	1	2	7	4	—	—	—	—	—	—
55-60%	1	—	5	9	4	1	2	2	—	—	—
60-65%	—	2	3	3	9	8	3	2	1	—	—
65-70%	—	—	4	6	8	4	6	3	1	—	—
70-75%	—	1	—	—	2	—	6	2	4	1	—
75-80%	—	—	2	—	5	3	4	8	—	—	—
80-85%	—	—	—	—	1	1	1	—	1	—	—
85-90%	—	—	—	—	—	—	—	2	—	—	—
90-95%	—	—	—	—	—	—	—	—	1	—	—

r=0.49

The value of "r" is highly significant.

Table 18

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN PHYSICS AND BIOLOGY

SAMPE SIZE —150 (Representing the population of Candidates who appeared for the Intervie w)

% age of Marks in Biology / % age of Marks in Physics	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
40-45%	—	—	—	—	—	—	1	—	—	—	—
45-50%	—	—	1	1	1	1	—	—	—	—	—
50-55%	—	—	3	2	4	3	4	—	—	—	—
55-60%	—	1	3	7	3	10	1	1	1	—	—
60-65%	—	3	3	10	8	4	3	2	1	—	—
65-70%	2	—	—	3	6	3	2	2	—	—	—
70-75%	—	2	—	3	1	2	8	4	2	—	—
75-80%	1	—	3	1	6	2	3	1	1	1	—
80-85%	1	—	—	—	—	—	1	2	3	1	—
85-90%	—	—	—	—	—	—	—	—	1	—	—
90-95%	—	—	—	—	—	—	—	—	—	—	—

r=0 2

The value of "r" is significant at 5% Level.

Table 19

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOLS MARKS IN MATH AND ONE OF THE SELECTION TOOLS (SCIENCE APTITUDE TEST OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for interview)

% age of Marks in Maths. / Marks in S.A.T.	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
30-40	—	—	—	1	1	1	—	2	2	—	—
40-50	—	—	—	3	2	3	2	2	2	4	1
50-60	1	2	1	3	3	5	2	3	3	3	2
60-70	1	1	2	1	3	6	3	6	6	3	3
70-80	3	3	1	3	3	2	7	1	5	—	—
80-90	—	2	1	3	5	3	1	1	2	3	—
90-100	1	—	1	—	—	4	2	—	1	—	—
100-110	—	—	—	1	—	—	—	—	—	1	—

$r = -0.027$

The value of "r" is not significant at 5% level.

Table 20

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOLS MARKS IN CHEMISTRY AND ONE OF THE SELECTION TOOLS (SCIENCE APTITUDE TEST) OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeard for Interview)

% age of Marks in Chemistry / Marks in S.A.T.	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
30-40	—	—	4	—	—	—	1	2	—	—	—	—
40-50	2	1	—	2	6	3	2	3	—	—	—	—
50-60	—	1	—	7	5	4	4	6	1	—	—	—
60-70	—	—	1	6	8	9	4	5	2	—	—	—
70-80	—	—	4	4	5	8	3	5	—	—	—	—
80-90	—	—	2	5	4	3	2	2	—	2	1	—
90-100	—	—	1	1	4	2	—	—	1	—	—	—
100-110	—	—	—	—	—	1	1	—	—	—	—	—

r=0.087

The value of r is not significant at 5% Level.

Table 21

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN PHYSICS AND ONE OF THE SELECTION TOOLS (SCIENCE APTITUDE TEST) OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for Interview).

% age of Marks in Physics Marks in S.A.T.	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
30-40	—	—	—	1	3	—	1	2	—	—	—
40-50	—	—	1	2	4	4	5	3	—	—	—
50-60	—	—	1	6	8	3	5	3	1	—	—
60-70	1	—	3	4	7	4	7	6	3	—	—
70-80	—	2	5	6	5	4	2	3	2	—	—
80-90	1	1	5	3	2	2	2	3	2	—	—
90-100	—	—	1	2	4	1	1		—	—	—
100-110	—	—	—	1	—	—	—	—	—	1	—

$r = -0.134$

· The value of r is not significant at 5% Level

Table 22

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOLS MARKS IN BIOLOGY AND ONE OF THE SELECTION TOOLS (SCIENCE APTITUDE TEST) OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for Interview)

% age of Marks in Biology / Marks in S.A T.	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
30-40	—	1	—	4	—	—	2	—	—	—	—
40-50	2	3	4	1	5	1	1	1	1	—	—
50-60	—	1	2	4	5	4	5	3	3	1	—
60-70	1	1	2	9	6	9	3	1	2	1	—
70-80	1	—	5	5	8	3	4	1	2	—	—
80-90	—	—	—	3	2	7	6	3	—	—	—
90-100	—	—	1	1	—	1	2	4	—	—	—
100-110	—	—	—	—	—	1	—	—	1	—	—

r=0.242

The value of "r" is significant at 5% Level

Table 23

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN MATHEMATICS AND ONE OF THE SELECTION TOOLS (ESSAY PAPER) OF S.T.S EXAMINATION

SAMLE SIZE :—150 (Representing the population of Candidates who appeared for the Interview)

% age of Marks in Maths & Essay Marks	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
5-10	—	—	—	—	—	1	—	1	—	—	2
10-15	—	—	—	—	1	—	1	1	2	—	—
15-20	1	—	2	3	3	2	4	1	5	3	1
20-25	1	2	2	3	1	13	5	5	3	3	2
25-30	2	2	—	5	7	3	4	2	4	4	—
30-35	2	3	2	4	2	3	2	2	3	2	2
35-40	—	1	—	—	2	2	—	3	2	1	—
40-45	—	—	—	—	1	—	1	—	2	1	—

r=—0.096

The value of "r" is not significant at 5% Level

Table 24

DEGEER OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN CHEMISTRY AND ONE OF THE SELECTION TOOLS ESSAY PAPER OF. S.T.S. EXAMINATION

% age Marks in Chemistry / Essay Marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
5-10	—	—	—	—	—	—	3	1	—	—	—
10-15	—	—	—	1	—	—	1	3	—	—	—
15-20	—	—	1	7	6	4	1	5	—	1	—
20-25	1	—	1	7	12	7	3	6	1	1	1
25-30	—	1	1	6	7	9	2	4	3	—	—
30-35	—	—	5	4	4	7	6	1	—	—	—
35-40	1	1	3	—	3	2	—	1	—	--	--
40-45	—	—	1	—	—	1	1	2	—	--	--

r=—0.187

The value of "r" is not significant at 5% Level

Table 25

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN PHYSICS AND ONE OF THE SELECTION TOOLS (ESSAY PAPER) OF S.T.S EXAMINATION

SAMPLE SIZE :—(Representing the population of candidates who appeared for the interview)

% age of Marks in Physics/Essay Marks	40–45%	45–50%	50–55%	55–60%	60–65%	65–70%	70–75%	75–80%	80–85%	85–90%	90–95%	95–100%
5-10	—	—	1	—	1	—	—	—	2	—	—	—
10-15	—	—	—	—	3	—	1	1	—	—	...	—
15-20	1	—	1	4	4	2	7	5	1	—	—	—
20-25	—	2	3	5	6	9	4	8	3	—	—	—
25-30	—	1	6	6	10	2	5	2	1	—	—	—
30-35	1	1	4	7	3	3	6	1	1	—	—	—
35-40	—	—	1	3	4	2	—	1	—	—	—	—
40-45	—	—	—	—	2	—	—	2	—	1	—	—

$r = -0.13$

The value of r is not significant at 5% level.

Table 26

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN BIOLOGY AND ONE OF THE SELECTION TOOLS (ESSY PAPER) OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for the Interview)

% of Marks in Biology / Essay Marks	40–45%	45–50%	50–55%	55–60%	60–65%	65-70%	70-75%	75–80%	80–85%	85-90%
5-10	—	1	1	—	—	—	—	—	2	—
10-15	—	—	—	1	—	2	1	1	—	—
15-20	1	—	2	3	8	5	2	—	3	1
20-25	1	1	4	7	9	6	7	3	2	—
25-30	2	2	4	7	4	3	7	2	1	1
30-35	—	1	1	3	4	8	4	6	—	—
35-40	—	1	3	3	1	2	—	1	—	—
40-45	—	—	—	2	—	—	2	—	1	—

$r = -0.043$

The value of "r" is not significant at 5% Level.

Table 27

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOLS MARKS IN MATHEMATICS AND ONE OF THE SELECTION TOOLS (PROJECT REPORT) OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for Interview)

% age of Marks in Maths/Marks in Project report	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
4-6	—	—	—	—	1	—	2	3	3	8	1
6-8	—	—	1	2	3	2	1	7	5	—	—
8-10	2	1	1	7	2	8	3	3	6	1	2
10-12	—	3	1	2	3	7	5	1	4	1	1
12-14	2	3	2	1	5	4	3	1	1	1	3
14-16	1	—	—	3	2	1	2	—	1	—	—
16-18	1	—	1	—	—	1	—	—	1	3	—
18-20	—	1	—	—	1	—	1	—	—	—	—
20-22	—	—	—	—	—	1	—	—	—	—	—

$r = -0.306$

The value of "r" is significant at 5% Level.

Table 28

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOLS MARKS IN CHEMISTRY AND ONE OF THE SELECTION TOOLS (PROJECT REPORT) OF S.T.S. EXAMINATION

SAMPLE SIZE —150 (Representing the population of Candidates who appeared for Interview).

% age Marks in Chemistry/Marks in Project report	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
4-6	—	—	—	—	5	6	3	4	—	—	—
6-8	—	—	2	3	4	5	2	4	2	—	—
8-10	2	—	2	8	8	3	6	4	—	2	—
10-12	—	—	2	4	9	10	1	1	1	—	—
12-14	—	1	4	6	3	1	3	7	1	—	—
14-16	—	1	—	3	1	3	—	1	—	—	1
16-18	—	—	1	—	1	2	2	1	—	—	—
18-20	—	—	—	1	1	—	—	1	—	—	—
20-22	—	—	1	—	—	—	—	—	—	—	—

$r = -0.109$

The value of "r" is not significant at 5% Level.

TABLE 29

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOLS MARKS IN PHYSICS AND ONE OF THE SELECTION TOOLS (PROJECT REPORT) OF S.T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for Interview)

% age of Marks in Physics / Marks in Project report	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%
4-6	—	—	—	—	5	2	6	5	—	—
6-8	—	—	1	4	6	1	3	5	2	—
8-10	—	2	5	7	5	6	4	5	3	—
10-12	1	1	5	4	7	7	1	—	1	—
12-14	—	1	2	4	8	1	6	2	1	—
14-16	1	—	2	2	2	1	—	1	1	—
16-18	—	—	—	2	—	—	3	1	—	1
18-20	—	—	—	2	—	—	—	1	—	—
20-22	—	—	—	1	—	—	—	—	—	—

$r = -0.161$

The value of "r" significant at 5% Level

Table 30

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN BIOLOGY AND ONE OF THE SELECTION TOOLS (PROJECT REPORT) OF S T.S. EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for Interview)

% age of Marks in Biology / Marks in Project report	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%
4-6	2	2	1	4	1	2	3	1	2	—
6-8	—	—	5	5	5	2	2	2	—	1
8-10	—	1	3	2	8	11	5	3	4	—
10-12	—	2	—	7	7	4	3	3	1	—
12-14	1	1	2	3	4	3	9	—	1	1
14-16	—	—	—	5	1	1	1	2	—	—
16-18	—	—	1	2	—	2	—	1	1	—
18-20	1	—	1	—	—	1	—	—	—	—
20 22	—	—	—	—	—	—	—	1	—	—

r=0.05

The value of "r" is not significant at 5% Level.

Table 31

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN MATHEMATICS AND ONE OF THE SELECTION TOOLS (INTERVIEW' OF S.T.S. EXAMINATION

SAMPLE SIZE .—150 (Representing the population of Candidates who appeared for the Interview)

%age of Marks in Mathematics / Interview Marks	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%	95-100%
0-5	—	—	—	—	—	—	—	1	1	—	1
5-10	—	2	—	—	2	4	1	5	2	2	—
10-15	2	1	2	5	9	5	2	6	8	3	2
15-20	—	2	3	6	3	10	3	3	3	2	—
20-25	—	1	1	1	1	4	6	1	1	3	—
25-30	2	2	—	1	1	1	4	1	3	2	—
30-35	2	—	—	—	—	1	—	—	2	1	3
35-40	—	1	—	2	—	—	—	—	—	—	—
40-45	—	—	—	—	—	—	1	—	—	—	—

r=—0 137

The Value of "r" is not significant at 5% Level

Table 32

DEGREE OF ASSOCIATION (CORRELATION) BERWEEN THE SCHOOL MARKS IN CHEMISTRY AND ONE OF THE SELECTION TOOLS (INTERVIEW) OF S T S EXAMINATION

SAMPLE SIZE :—150 (Representing the population of Candidates who appeared for the Interview)

%age of Marks in Chemistry / Interview Marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
0-5	—	—	—	—	—	—	3	—	—	—	—
5-10	—	—	2	1	8	3	3	1	—	—	—
10-15	—	—	3	12	8	9	6	5	2	—	—
15-20	—	2	3	7	7	7	3	4	—	1	1
20-25	—	—	2	3	5	3	1	4	1	—	—
25-30	1	1	—	2	3	3	2	5	—	—	—
30-35	—	—	1	—	1	2	—	4	1	—	—
35-40	—	—	1	1	—	1	—	—	—	—	—
40-45	—	—	—	—	—	—	—	—	—	1	—

r=0.096

The value of "r" is not significant at 5% Level

Table 33

DEGREE OF ASSOCIATION (CORRELATION) BETWEEN THE HIGH SCHOOL MARKS IN PHYSICS AND ONE OF THE SELECTION TOOLS (INTERVIEW) OF S.T.S. EXAMINATION

SAMPLE SIZE :— 150 (Representing the population of Candidates who appeared for Interview)

%age of Marks in Physics / Interview Marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
0-5	—	—	—	—	1	—	1	1	—	—	—
5-10	—	—	2	2	3	4	6	1	—	—	—
10-15	—	—	4	10	9	2	10	6	3	1	—
15-20	—	2	7	7	6	2	6	3	2	—	—
20-25	1	2	1	1	8	5	—	1	—	—	—
25-30	—	—	1	3	3	2	2	4	2	—	—
30-35	—	—	—	1	1	3	1	2	1	—	—
35-40	—	—	1	2	—	—	—	-	—	—	—
40-45	—	—	—	—	—	—	—	1	-	—	—

$r = -.014$

The value of "r" is not significant at 5% Level

Table 34

DEGREE OF ASSOCIATION (CORRELATION) BETWEGN THE HIGH SCHOOL MARKS IN BIOLOGY AND ONE OF THE SELECTION TOOLS (INTERVIEW) OF S T S EXAMINATION

SAMPLE SIZE .—150 (Representing the population of Candidates who appeared for Interview)

% age of marks in Biology/Interview Marks	40-45%	45-50%	50-55%	55-60%	60-65%	65-70%	70-75%	75-80%	80-85%	85-90%	90-95%
0-5	—	1	—	—	1	—	—	1	—	—	—
5-10	—	1	—	9	4	—	1	2	1	—	—
10-15	—	4	4	5	9	12	6	—	5	—	—
15-20	—	1	5	5	5	8	6	3	2	—	—
20-25	2	—	2	5	5	1	3	1	—	—	—
25-30	2	—	3	1	3	1	5	2	—	—	—
30-35	—	—	—	1	—	3	1	1	1	2	—
35-40	—	—	—	1	1	—	1	—	—	—	—
40-45	—	—	—	—	—	1	—	—	—	—	—

r=0.097

The value of r is not significant at 5% level

Steps needed in calculating $R_{S.A.T\ (M,C,P,B)}$ as a sample are indicated below

Variable X_1 represents the marks scored in S.A T

,,	X_2	do	in Mathematics	(M)
,,	X_3	do	in Chemistry	(C)
,,	X_4	do	in Physics	(P)
,,	X_5	do	in Biology	(B)

$$1-R_1^2\ (2345) = \frac{W}{W_{11}} = \frac{.396}{.450}$$

Where $W =$

$$\begin{vmatrix} 1 & r_{12} & r_{13} & r_{14} & r_{15} \\ r_{21} & 1 & r_{23} & r_{24} & r_{25} \\ r_{31} & r_{32} & 1 & r_{34} & r_{35} \\ r_{41} & r_{42} & r_{43} & 1 & r_{45} \\ r_{51} & r_{52} & r_{53} & r_{54} & 1 \end{vmatrix}$$

W_{11} is co-factor of the element in the 1st row and first column in W

The test of significance is.

$$F = \frac{R^2}{1-R^2} \quad \frac{N-P-1}{P} \qquad \begin{matrix} P = 4 \\ N-P-1 = 145 \end{matrix} \text{ Degrees of freedom}$$

$(4,145)$

APPENDIX XVIII

STATEWISE FREQUENCY DISTRIBUTION OF THE MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUDE TEST OF THE N.S.T.S. EXAMINATION MARCH 1964.

Scored Marks	Assam	A P.	Bihar	Delhi	Guj.	H.P.	Imphal	M.S.	M.P.	Mad.	Mys.	Ori-ssa.	Goa.	Pond.	Pb.	Raj.	Tri-Pura	U.P.	W.B.
0-9	13	88	51	3	35	3	—	49	278	—	11	7	—	—	35	55	3	740	46
10-19	14	132	56	6	31	9	—	63	216	11	30	19	—	—	64	81	5	684	108
20-29	15	112	43	32	30	10	—	66	156	29	54	22	—	13	137	80	6	466	118
30-39	19	54	30	60	17	8	—	48	86	41	34	21	—	15	113	54	2	252	80
40-49	9	39	19	64	9	3	2	41	48	36	32	7	1	14	113	25	—	122	56
50-59	8	11	10	60	4	1	7	21	32	26	30	9	—	9	55	6	1	64	32
60-69	4	6	7	34	2	1	3	12	11	21	15	4	1	4	39	2	2	33	20
70-79	3	3	4	38	1	—	1	10	11	10	8	3	—	3	10	3	—	18	20
80-89	3	—	2	34	—	—	—	4	4	7	3	1	—	—	6	3	1	8	11
90-99	1	2	—	20	2	—	—	7	3	2	7	1	1	1	3	—	—	9	6
100-109	—	—	—	10	—	—	—	3	1	1	—	—	—	—	4	—	—	1	31
110-119	—	—	—	4	—	—	—	1	—	1	—	—	—	—	—	—	—	1	1
120-129	—	—	—	2	—	—	—	1	—	—	—	—	—	—	—	—	—	—	1
130-139	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
Total	89	447	222	366	131	35	13	326	846	186	224	94	3	59	579	309	19	2398	500
Mean ($\bar{x}$)	34.3	22.5	24.5	56.2	22.5	26.2	56.8	32.1	20.5	45.9	38.1	32.3		42.9	36.0	23.6	25 6	19.8	32.6
S.D.	21 9	15.2	18.0	23.5	17.4	13.6	8.0	23.2	17.4	20.5	21 0	19.1		15 5	18 6	15 3	17 7	16 2	21.5
V%	63.7	67.4	73 6	41.8	76.0	52.0		72.2	84.8	44.5	55.1	59.2		31.5	51.5	64.7	69 2	81.7	66 0
Rank of (v)	8	11	13	2	14	5		12	16	3	6	7		1	4	9	12	15	10

STATEWISE FREQUENCY DISTRIBUTION OF THE MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUDE TEST OF THE N.S.T.S. EXAMINATION YEAR 1965

Scored Marks	Assam	A P.	Bihar	Delhi	Guj.	Goa	H.P.	Imphal	J. & K.	Kerala	M.S.	M.P.	Mad.	Mys.	Orissa	Pond.	Pb.	Raj.	Tri-pura	U.P.	W.B.
0-9	2	112	32	24	15	—	—	1	3	10	—	319	52	6	1	2	64	90	4	638	86
10-19	7	142	44	36	31	—	6	3	6	21	14	233	77	17	2	8	88	98	8	509	69
20-29	10	130	37	46	25	—	4	—	4	11	25	143	93	33	8	14	107	60	6	273	62
30-39	10	80	23	87	10	1	3	5	3	7	29	103	100	40	9	4	85	32	5	117	42
40-49	6	37	17	100	4	1	—	—	1	7	45	109	65	30	6	13	61	15	1	60	30
50-59	3	25	9	100	2	1	—	5	—	2	48	35	38	31	5	11	26	7	2	31	41
60-69	4	6	9	60	5	1	—	—	—	1	24	19	18	9	4	7	11	7	—	16	16
70-79	—	6	3	53	1	1	—	—	—	1	12	11	12	8	2	—	7	4	1	15	22
80-89	—	3	2	35	1	—	—	—	1	1	14	1	5	5	1	—	2	—	1	6	10
90-99	—	—	2	29	—	—	—	—	—	—	12	—	1	2	—	—	1	—	—	3	10
100-109	—	2	1	12	—	—	—	—	—	—	9	1	—	2	—	—	—	—	—	3	5
110-119	—	—	1	—	—	—	—	—	—	—	5	—	—	—	—	—	—	—	—	1	1
120-129	—	—	—	2	—	1	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—
Total	42	543	180	586	94	6	13	14	17	61	238	975	461	184	38	59	452	343	28	1670	394
(Mean)	33.1	23.6	26.0	50.9	23.9	64.6	22.2	35 3	20.4	24.7	50 9	21.5	31 7	41.4	41 5	37.7	28 2	19.8	27 5	17.1	33.1
S.D.	16.1	16.7	17.0	24.1	17.1			17.3	12 0	17 7	23 2	17 5	17.7	20.9	17.	18.00	17.1	15 0	20 0	15 3	26.3
Y%	48.7	70.9	65.5	47 3	71.7				58 8	71.6	45 5	81.2	55 6	50 3	42.6	48.0	60.5	76.0	72 7	89.4	79 5
Rank of (Y)	5	11	10	3	13				8	12	2	17	7	6	1	4	9	15	14	18	16

STATEWISE FREQUENCY DISTRIBUTION OF THE MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUDE TEST OF THE N.S.T S. EXAMINATION YEAR 1966

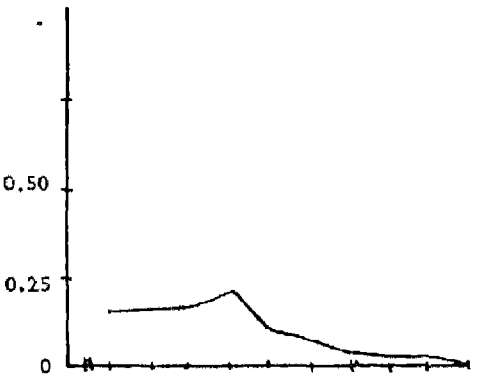
Scored	Assam	A P	Bihar	Delhi	Guj.	J K.	Kerala	M S.	M P.	Madras	Mysore	Orissa	Punjab	Raj.	U P.	U T.	W. B
0-9	16	39	14	2	19	3	3	68	246	22	2	2	11	60	288	4	3
10-19	6	52	19	20	14	1	7	65	190	46	12	2	29	66	240	3	18
20-29	13	49	30	41	3	3	12	51	100	53	18	5	53	38	126	6	36
30-39	2	27	16	61	4	4	27	29	48	54	17	3	40	14	78	13	44
40-49	7	16	12	115	4	—	29	26	26	34	17	2	41	10	36	5	36
50-59	4	10	1	85	4	—	20	21	11	19	9	4	28	1	23	1	31
60-69	3	3	1	92	5	—	22	18	7	9	7	2	8	2	14	5	22
70-79	—	—	2	73	1	—	11	6	6	2	8	4	5	4	14	3	27
80-89	—	2	—	48	—	—	8	6	3	4	5	1	1	—	6	—	15
90-99	—	—	1	25	1	—	—	4	1	—	2	1	—	1	2	—	7
100-109	—	—	—	2	—	—	1	—	—	—	2	—	—	—	1	—	—
Total No. of candidates	51	203	103	564	55	11	140	294	638	243	100	23	216	196	828	40	239
Mean ($\bar{x}$)	24.5	24 5	23.2	55.2	24.5	21.8	48 2	28.3	17.2	31.3	43.4	41.5	34 5	18 2	18.5	37 0	47 4
S.D.	18 2	16.4	17.2	19.8	22.2	11.9	19.5	22 3	15.1	17 1	23 2	17.3	16.3	14.5	17.3	18 5	21.6
% age of Co-efficient of Variation (v)	74 1	67.1	60.9	35 9	90.5	54.4	40.3	78 7	87.8	54 8	53.4	41.7	47.1	80.0	93.5	50.0	45.5
Rank of (v)	12	11	10	1	16	8	2	13	15	9	7	3	5	14	17	6	4

APPENDIX XVIII (Contd.)

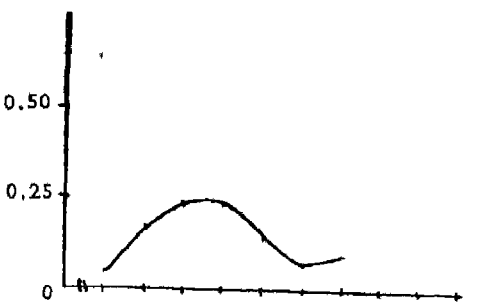
RELATIVE FREQUENCY CURVES (R F.) REPRESENTING DISTRIBUTIO N OF MARKS SCORED BY THE CANDIDATES IN SCIENCE APTITUDE TEST YEAR 1964, 1965 AND 1966

ASSAM

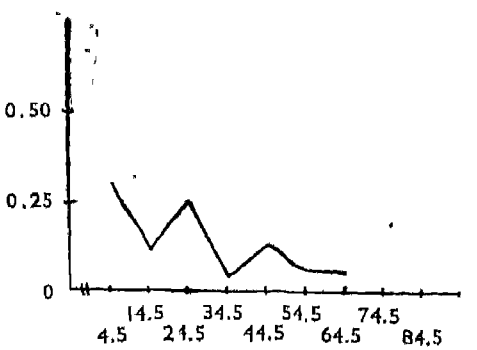
YEAR 1964



YEAR 1965

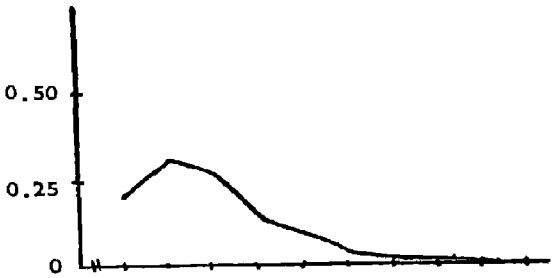


YEAR 1966

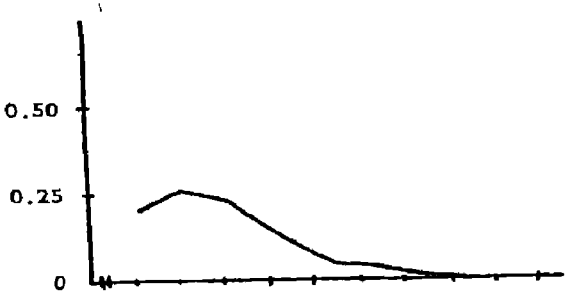


A. P.

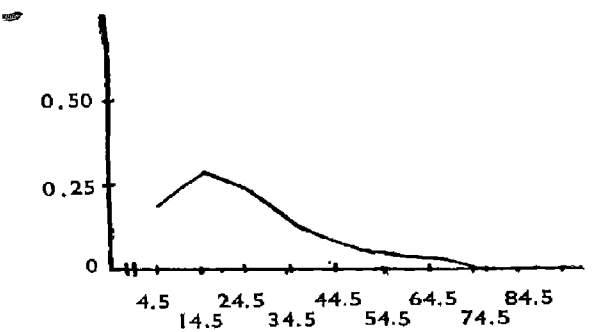
YEAR 1964



YEAR 1965

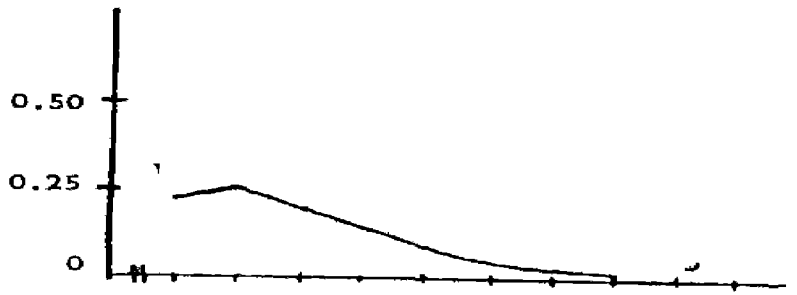


YEAR 1966

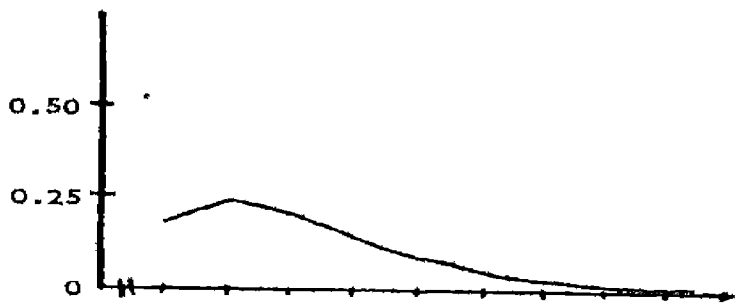


BIHAR

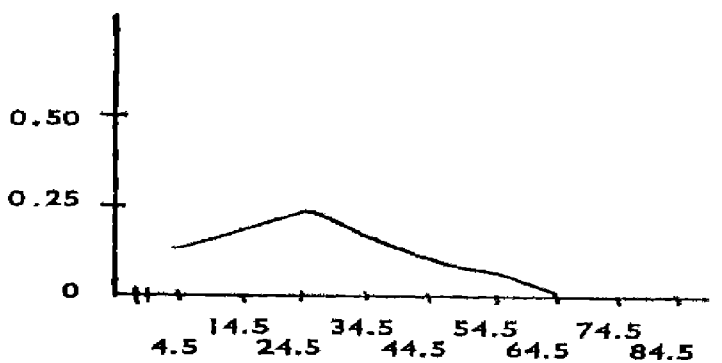
YEAR 1964



YEAR 1965

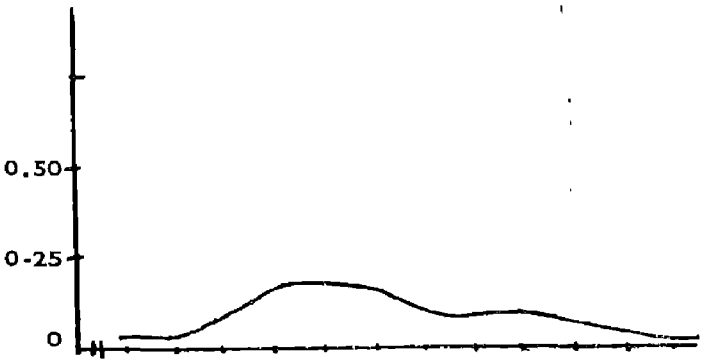


YEAR 1966

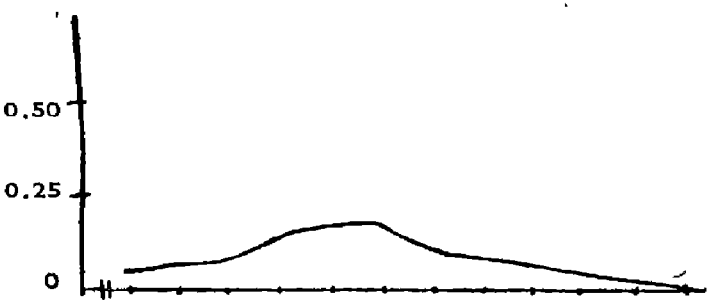


DELHI

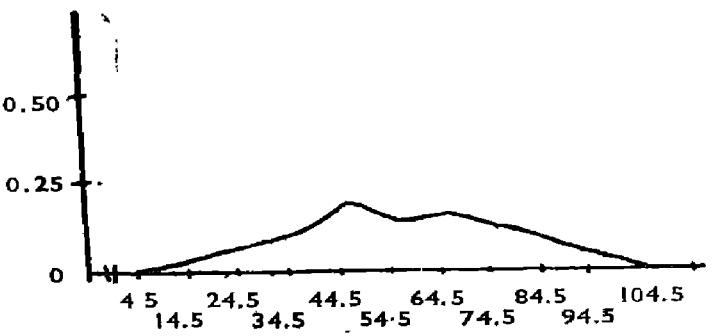
YEAR 1964



YEAR 1965

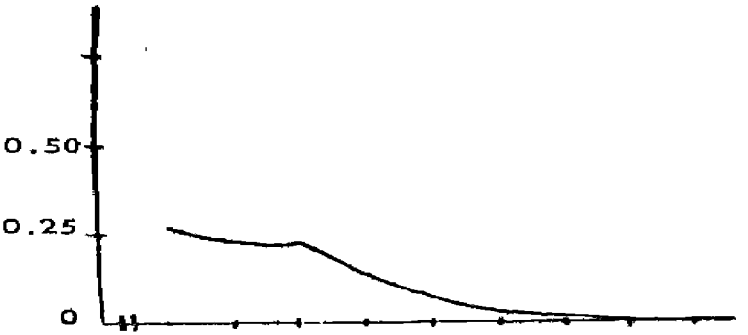


YEAR 1966

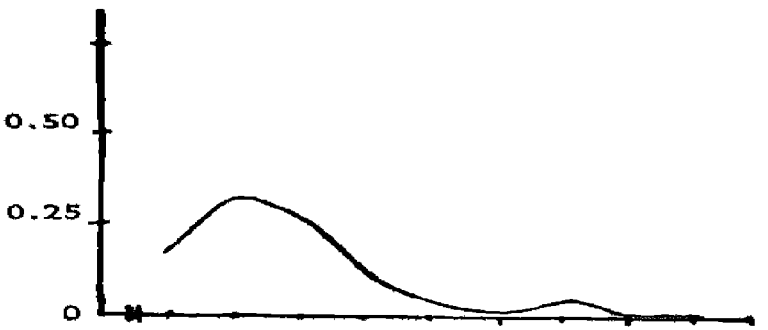


GUJARAT

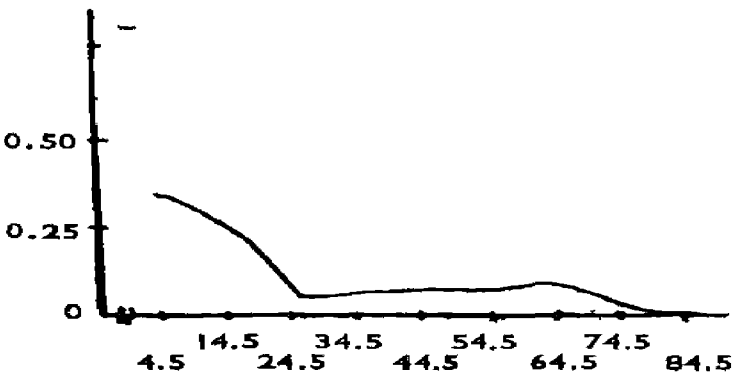
YEAR 1964



YEAR 1965



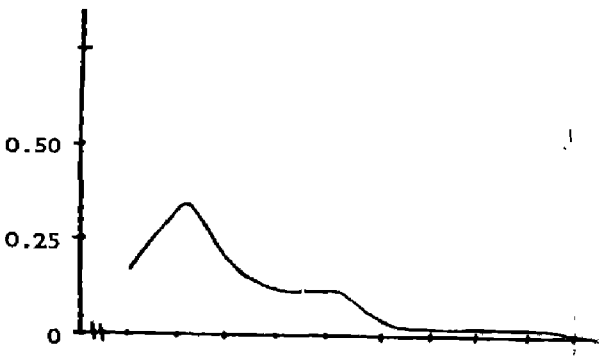
YEAR 1966



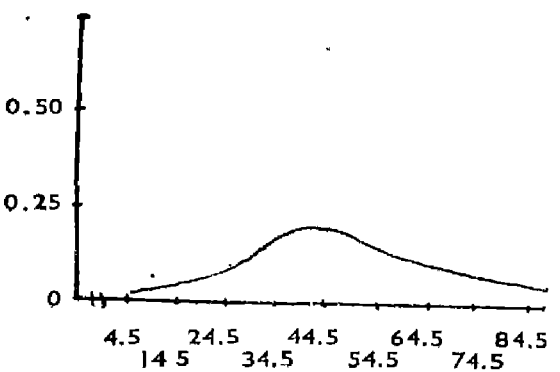
KERALA

YEAR 1964
NO STUDENT

YEAR 1965

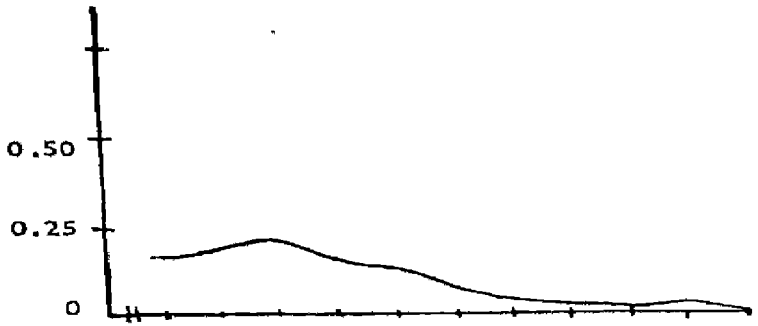


YEAR 1966

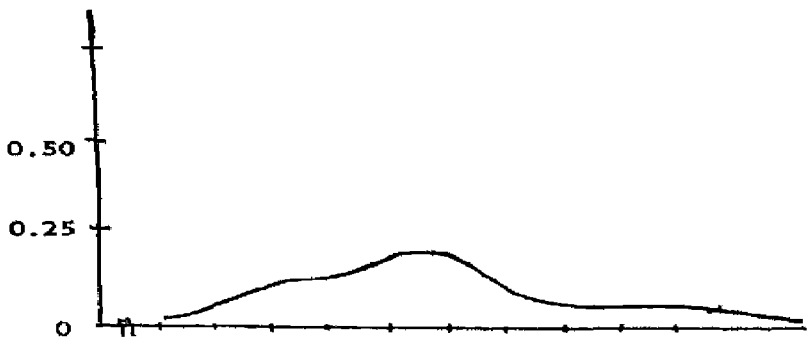


M. S.

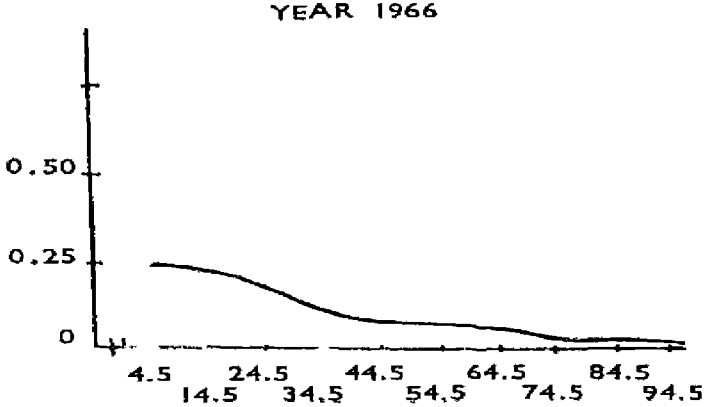
YEAR 1964



YEAR 1965

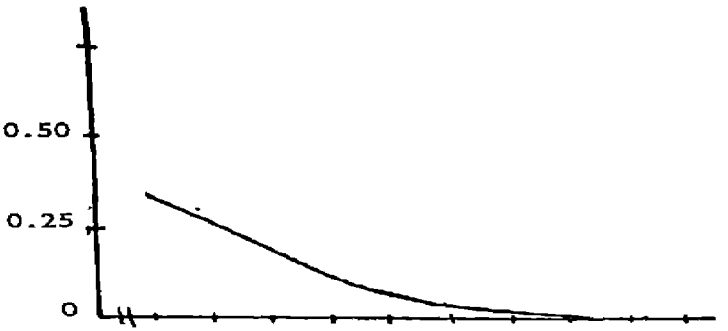


YEAR 1966

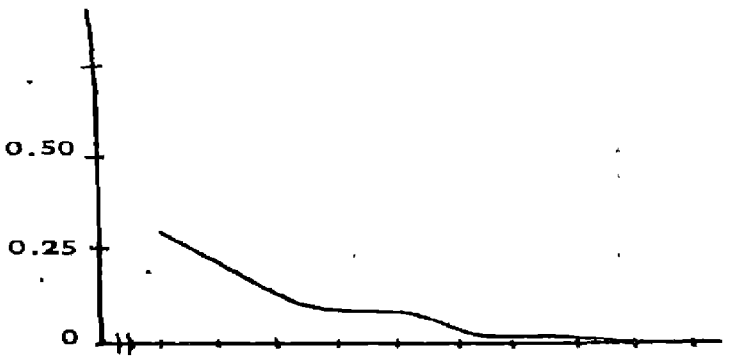


M. P.

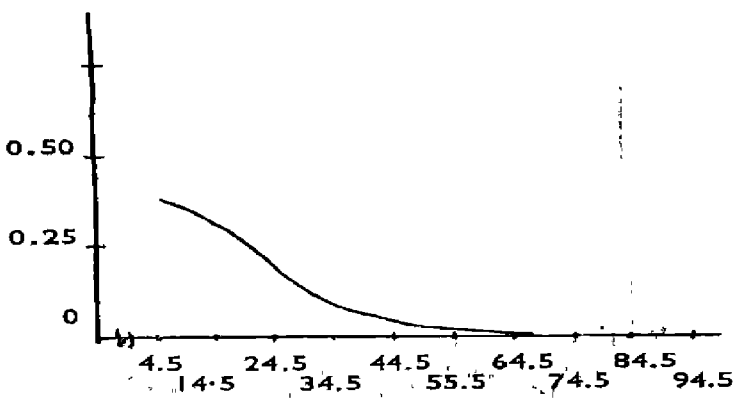
YEAR 1964



YEAR 1965

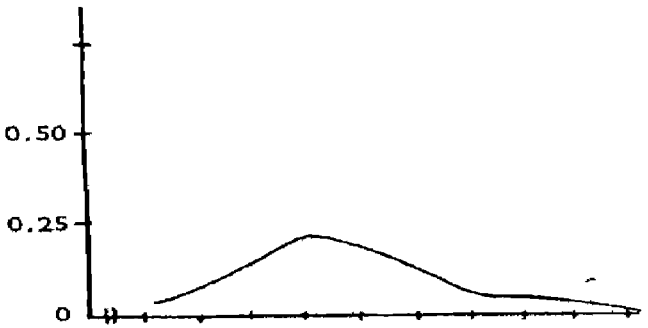


YEAR 1966

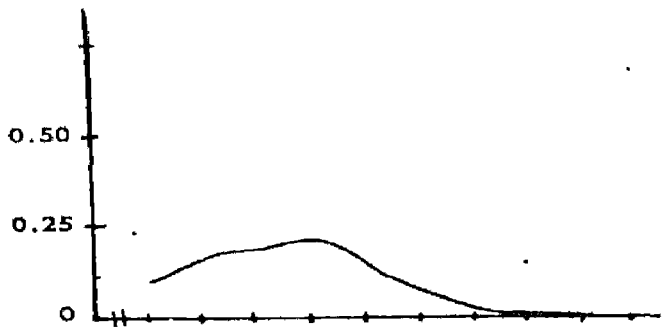


MADRAS

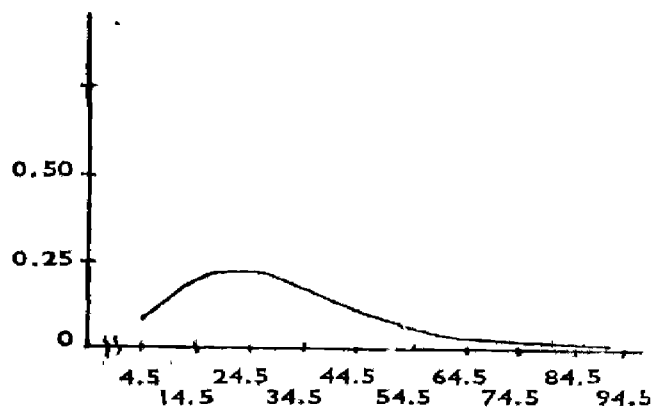
YEAR 1964



YEAR 1965

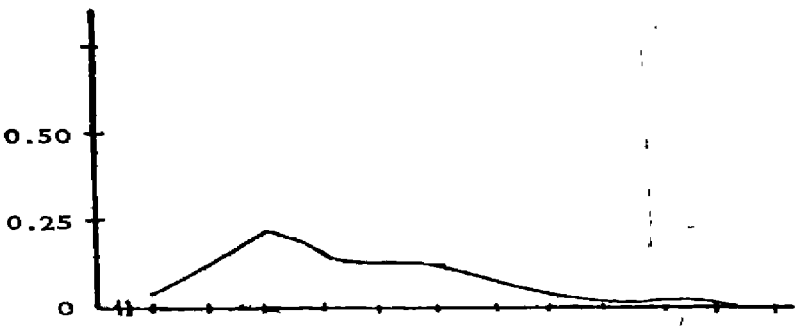


YEAR 1966

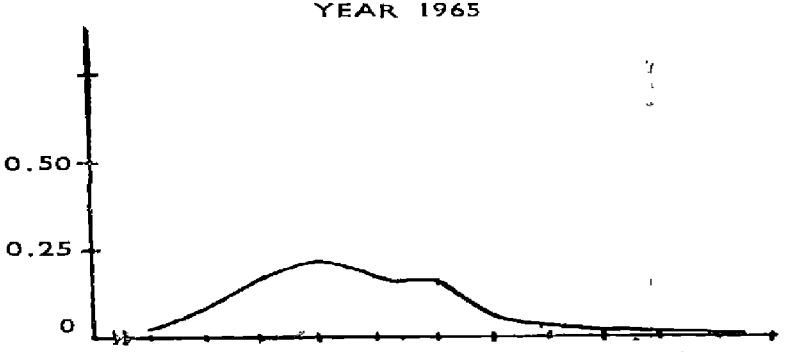


MYSORE

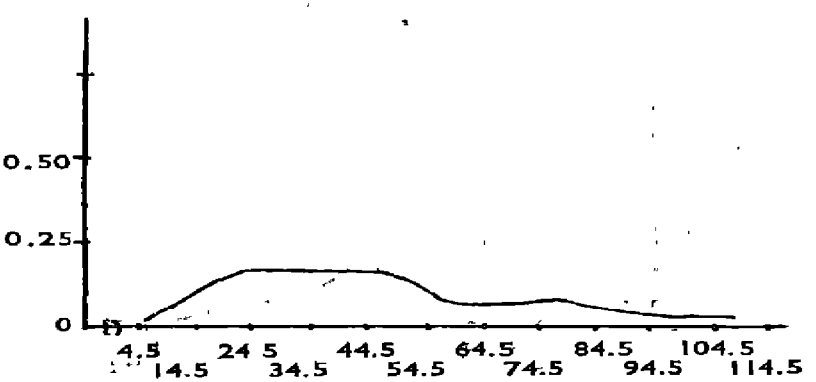
YEAR 1964



YEAR 1965

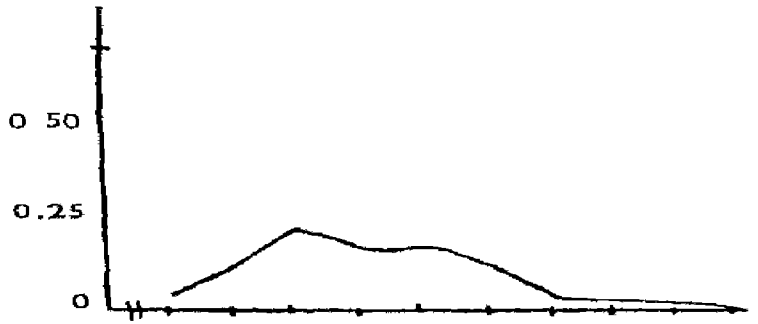


YEAR 1966

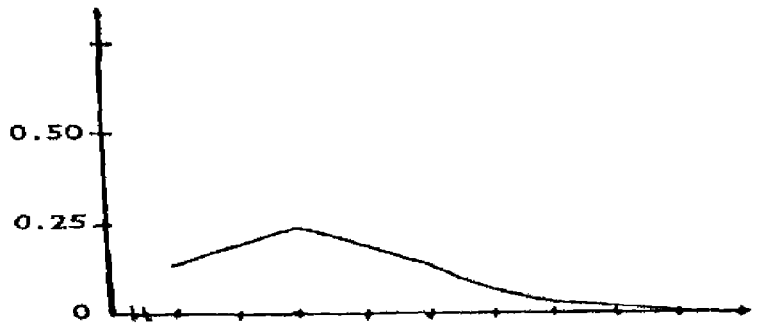


PUNJAB

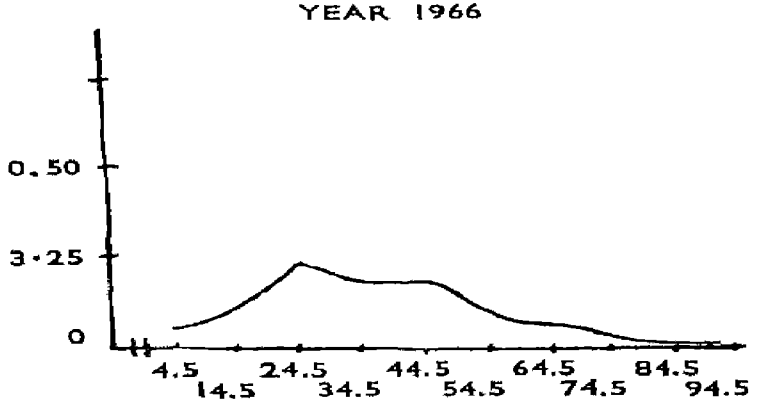
YEAR 1964



YEAR 1965

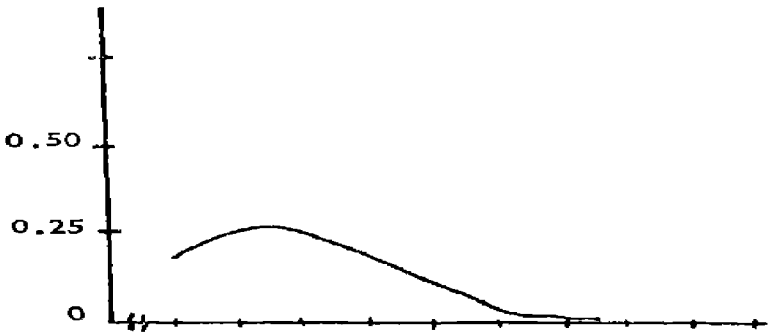


YEAR 1966

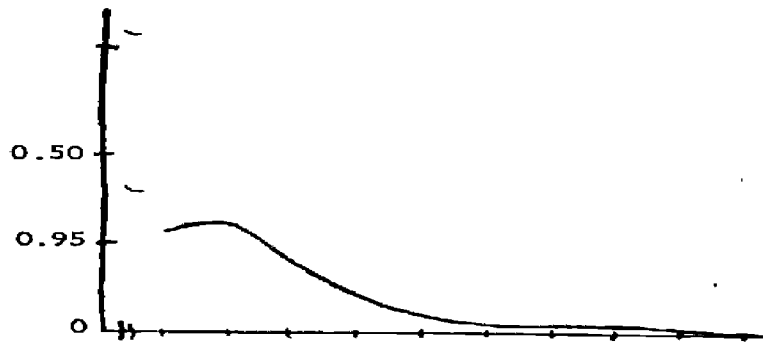


RAJASTHAN

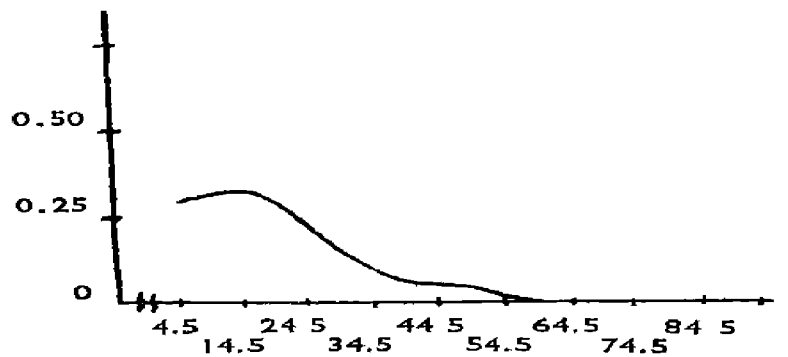
YEAR 1964



YEAR 1965

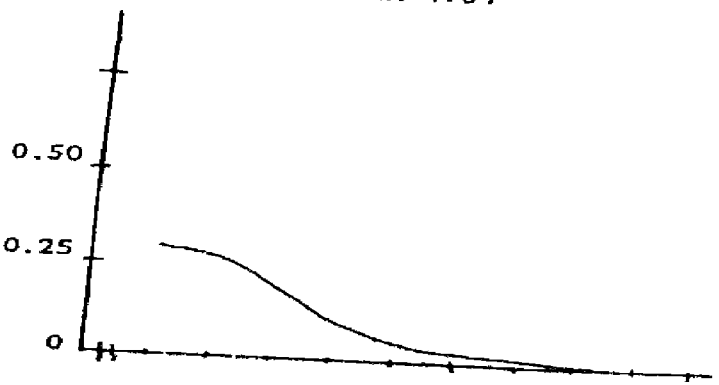


YEAR 1966

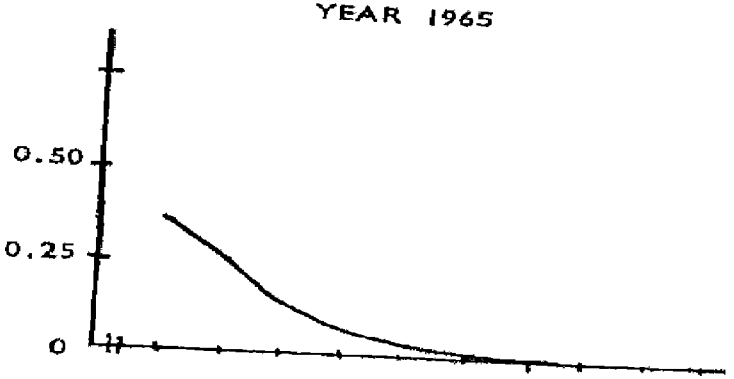


U. P.

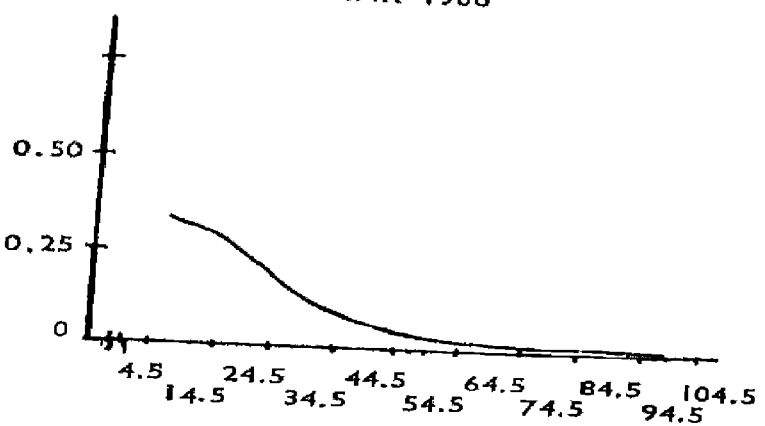
YEAR 1964



YEAR 1965

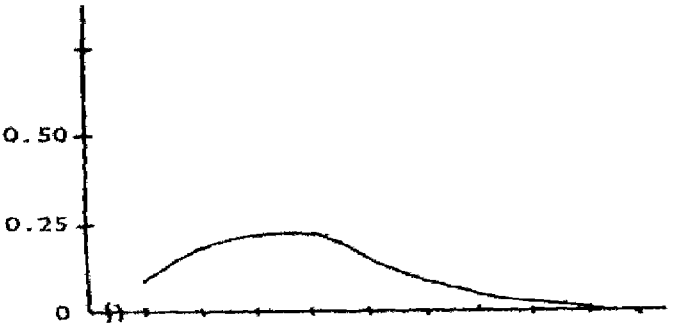


YEAR 1966



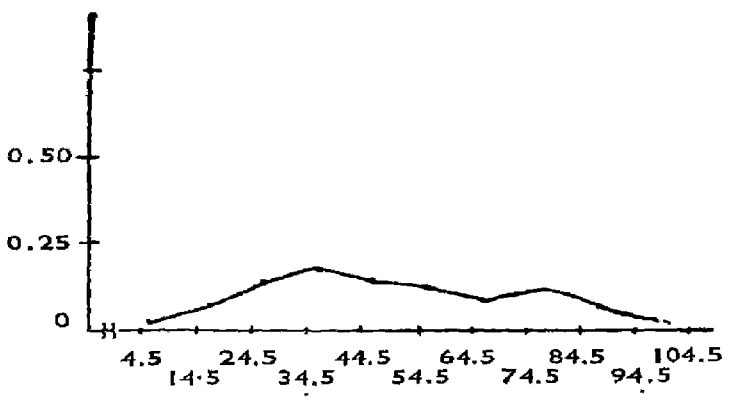
W. BENGAL

YEAR 1964



YEAR 1965

YEAR 1966



APPENDIX XIX

PREDICTIVE AND FOLLOW UP (COMPARATIVE) DATA OF STUDENTS WHO SECURED FIRST CLASS AT THE HIGHER SECONDARY EXAMINATION, 1966 AND WHO SECURED A PLACE IN THE MERIT LIST OF THE NATIONAL SCIENCE TALENT SEARCH EXAMINATION AS AGAINST THOSE WHO COULD NOT SECURE A POSITION.

	Selected Group		Unselected Group			
	Mean (M_1)	S.D.1	Mean (M_2)	S.D.2	C.R. Value	Significance Level
1. Science aptitude test score (Total marks 125)	73.80	13.03	52 90	9.59	6.85	1%
2. Essay score (Total marks 50)	28 20	6.92	21.20	6.70	3.92	1%
3. Project Report score (Total marks 25)	13.00	4.35	10.20	3.10	2 83	5%
4. Interview marks (Total marks 50)	20.30	8.66	9.60	5.92	5.49	1%
5. % age of score in Mathematics (Higher Secondary or equivalent)	85.50	9.75	77.60	13.45	2 53	5%
6. % age of score in Physics (Higher Secondary or equivalent)	75.40	7.74	66.20	10.34	3 83	1%
7. % age of score in Chemistry (Higher Secondary) or equivalent	75.40	10.1	67.10	12.53	2.76	5%
8. % age of Total score (Higher Secondary) or equivalent	78.7	22.60	70.3	28.86	6.38	1%

APPENDIX XIX (Contd.)

Table B

LANGUAGE-WISE DISTRIBUTION OF CANDIDATES WHO APPEARED AND A STATE-WISE STATEMENT OF THE AVERAGE SCORE SCORED BY THE EXAMINEES AT THE ESSAY PAPER, 1966.

Sl. No.	State	English	Hindi	Punjabi	Gujarati	Marathi	Kannada	Urdu	Bengali	Malayalam	Assamese	Tamil	Telugu	Oriya	Total	Average Marks Scored
1.	Andhra Pradesh	91	5	—	—	1	—	2	5	—	—	—	96	—	195	20.07
2.	Assam	9	—	—	—	—	—	—	6	—	37	—	—	1	51	20.43
3.	Bihar	14	78	—	—	—	—	1	—	—	—	—	—	1	100	22 42
4.	Delhi	541	21	1	—	—	—	—	—	1	—	—	—	—	564	19.04
5.	Gujarat	16	—	—	39	—	—	—	—	—	—	—	—	—	55	15 54
6.	Jammu & Kashmir	9	2	—	—	—	—	—	—	—	—	—	—	—	11	20 06
7.	Kerala	116	1	—	—	—	—	—	—	24	—	—	—	—	141	20 76
8.	Madhya Pradesh	60	579	—	—	2	—	—	—	—	—	—	—	—	641	20.37
9.	Madras	84	2	—	—	—	—	—	—	—	—	158	—	—	244	28.70
10.	Maharashtra	97	7	—	3	185	—	—	—	—	—	—	—	—	293	16.00
11.	Mysore	64	1	—	—	2	32	—	—	—	—	—	—	—	100	17.88
12.	Orissa	13	—	—	—	—	—	—	—	—	—	—	—	9	22	20.80
13.	Punjab	105	90	22	—	—	—	—	—	—	—	—	—	—	217	20 00
14.	Rajasthan	9	181	—	—	—	—	—	—	—	—	—	—	—	190	22.43
15.	Uttar Pradesh	152	676	1	—	—	—	—	—	—	—	—	—	—	829	15.54
16	West Bengal	78	6	—	—	—	—	1	154	—	—	—	—	—	239	15.80
17.	Union Territories Except Delhi	38	2	2	—	—	—	—	—	—	—	—	—	—	40	21.80
Total		1496	1651	24	42	190	32	4	165	27	37	158	96	10	3932	
%age of Examinees		38.0%	42.0%	0.6%	1.0%	4.8%	0.8%	0.0%	4.8%	0.6%	0.9%	4 0%	2 4%	0.2%	100%	
Average Marks scored		19.26	18 65	19.77	15.77	16.08	17.88	19.69	16.18	19 75	20.43	28.70	20 07	20.96	19.10	